Onan

Service Manual

UN

Generator and Controls

- Description
- Troubleshooting Chart
- Testing Procedures
- Repairs
- Wiring Diagrams

900-0196
9-96

Cummins Power Generation

Safety Precautions

Before operating the generator set, read the Operator's Manual and become familiar with it and the equipment. **Safe and efficient operation can be achieved only if the unit is properly operated and maintained.** Many accidents are caused by failure to follow fundamental rules and precautions.

The following symbols, found throughout this manual, alert you to potentially dangerous conditions to the operator, service personnel, or the equipment.

DANGER ***This symbol warns of immediate hazards which will result in severe personal injury or death.***

WARNING ***This symbol refers to a hazard or unsafe practice which can result in severe personal injury or death.***

CAUTION ***This symbol refers to a hazard or unsafe practice which can result in personal injury or product or property damage.***

FUEL AND FUMES ARE FLAMMABLE. Fire, explosion, and personal injury can result from improper practices.

- DO NOT fill fuel tanks with the engine running unless tanks are outside the engine compartment. Fuel contact with hot engine or exhaust is a potential fire hazard.
- DO NOT SMOKE OR ALLOW AN OPEN FLAME near the generator set or fuel tank. Internal combustion engine fuels are highly flammable.
- Fuel lines must be adequately secured and free of leaks. Fuel connections at the engine should be made with an approved flexible line. Do not use copper piping on flexible lines as copper will work harden and become brittle.
- Be sure that all fuel supplies have a positive shutoff valve.
- DO NOT SMOKE while servicing batteries. Lead acid batteries emit a highly explosive hydrogen gas that can be ignited by electrical arcing or by smoking.

EXHAUST GASES ARE DEADLY

- Provide an adequate exhaust system to properly expel discharged gases. Inspect the exhaust system daily for leaks per the maintenance schedule. See that exhaust manifolds are secure and are not warped. Do not use exhaust gases to heat a compartment.
- Be sure the unit is well ventilated.

MOVING PARTS CAN CAUSE SEVERE PERSONAL INJURY OR DEATH

- Keep your hands away from moving parts.
- Before performing any maintenance on the generator set, disconnect the starting battery negative (–) ground lead first. This will prevent accidental starting.
- Make sure that fasteners on the generator set are secure. Tighten supports and clamps, keep guards in position over fans, drive belts, etc.
- Do not wear loose clothing or jewelry while servicing any part of the generator set. Loose clothing and jewelry can become caught in moving parts. Jewelry can short out electrical contacts and cause shock or burning.
- If adjustment *must* be made while the unit is running, use extreme caution around hot manifolds, moving parts, etc.

ELECTRICAL SHOCK WILL CAUSE SEVERE PERSONAL INJURY OR DEATH

- Remove electric power before removing protective shields or touching electrical equipment. Use rubber insulative mats placed on dry wood platforms over floors that are metal or concrete when around electrical equipment. Do not wear damp clothing (particularly wet shoes) or allow skin surfaces to be damp when handling electrical equipment.
- Use extreme caution when working on electrical components. High voltages can cause injury or death. DO NOT tamper with interlocks.
- Follow all state and local electrical codes. Have all electrical installations performed by a qualified licensed electrician. Tag open switches to avoid accidental closure.
- DO NOT CONNECT THE GENERATOR SET DIRECTLY TO ANY BUILDING ELECTRICAL POWER SYSTEM. Hazardous voltages can flow from the generator set into the utility line. This creates a potential for electrocution or property damage. Connect only through an approved device and after building main switch is open. Consult an electrician in regard to emergency power use.

GENERAL SAFETY PRECAUTIONS

- Provide appropriate fire extinguishers and install them in convenient locations. Consult your local fire department for the correct type of extinguisher to use. *Do not use foam on electrical fires.* Use extinguisher rated ABC by NFPA.
- Used engine oils have been identified by some state or federal agencies as causing cancer or reproductive toxicity. When checking or changing engine oil, take care not to ingest, breathe the fumes, or contact used oil.
- Benzene and lead, found in some gasoline, have been identified by some state and federal agencies as causing cancer or reproductive toxicity. When checking, draining or adding gasoline, take care not to ingest, breathe the fumes, or contact gasoline.
- Make sure that rags are not left on or near the engine.
- Remove all unnecessary grease and oil from the unit. Accumulated grease and oil can cause over heating and engine damage, and present a potential fire hazard.
- Keep the generator set and the surrounding area clean and free from obstructions. Remove any debris from the set and keep the floor clean and dry.
- Do not work on this equipment when mentally or physically fatigued, or after consuming any alcohol or drug that makes the operation of equipment unsafe.

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Introduction

This manual provides troubleshooting and repair information for Onan UN generators. It includes procedures for repairing the generator and control system. This information does not apply to the engine; engine information is provided in the ENGINE portion of the Master Service Manual (922-0501).

⚠WARNING ***Many troubleshooting procedures present hazards which can result in severe personal injury or death. Only qualified service personnel with knowledge of electricity and machinery hazards should perform service procedures. Review safety precautions on inside cover page.***

TEST EQUIPMENT

Most of the tests described in this manual can be made with an AC-DC multimeter. Other test equipment includes:

- Onan Multi-Tester 420-0303
- Wheatstone or Kelvin bridge (tests resistance values below one ohm)
- Continuity tester (6 volt)
- Jumper wires
- Onan load test panels 420-0413, 420-0414, 420-0501
- Onan armature growler 420-0194

⚠WARNING ***Electrical shock can cause severe personal injury or death. Do not touch electrical wiring or components during testing. Disconnect electrical power by removing the starting battery negative (-) cable before handling electrical wiring or components.***

⚠WARNING ***Electrical shock can cause severe personal injury or death. Use extreme caution when working on electrical circuitry. Attach and remove meter leads only when generator set is not operating. Do not touch meter or meter leads during testing.***

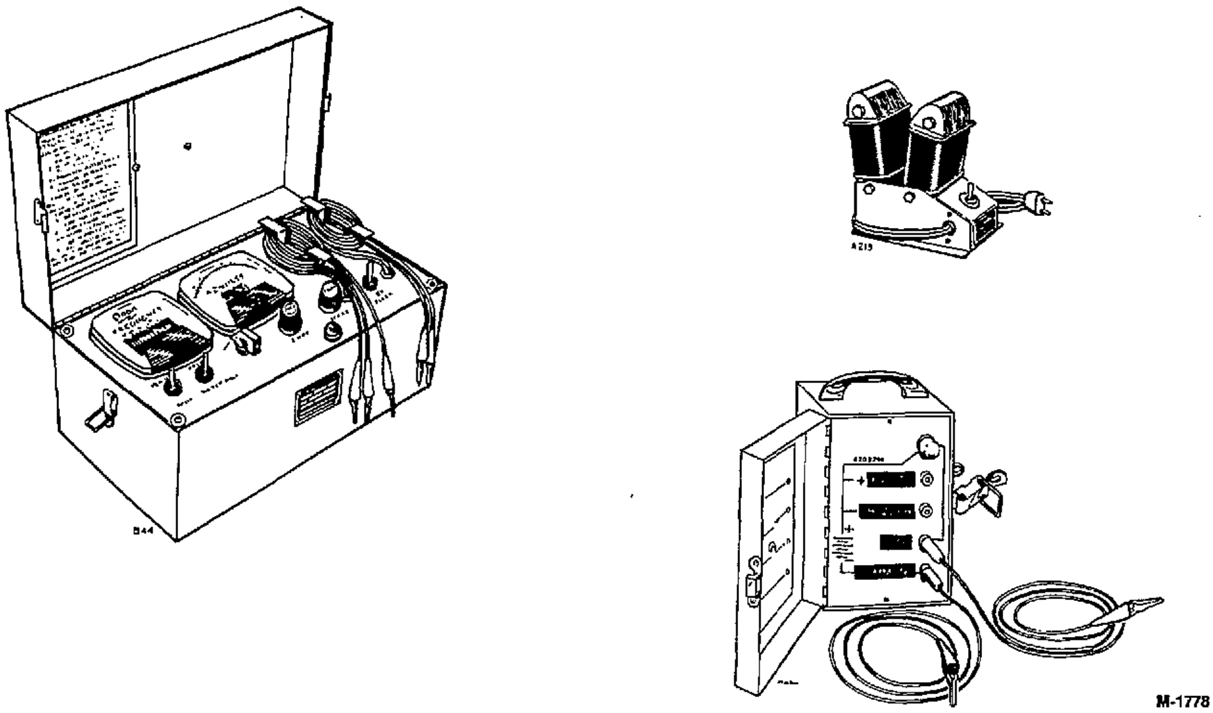


FIGURE 1-1. TEST EQUIPMENT

LOAD WIRE CONNECTIONS

⚠WARNING ***Electrical shock can cause severe personal injury or death. Check voltage at the main junction box to be sure power has been disconnected before disconnecting load wires.***

The genset nameplate displays its electrical output rating in watts, volts and hertz. Table 1-1 lists these figures for gensets using the UN generator. Contractor and portable gensets are prewired, and include a receptacle box with two duplex 120-volt, 15-ampere grounding receptacles and two 240-volt, 20-ampere, twist-lock receptacles (Figure 1-2). Figures 1-4 and 1-5 show the electrical circuits and connections for various voltages on all other UN-based generator sets.

TABLE 1-1. ELECTRICAL DATA FOR UN GENERATORS

GENERATOR SET SERIES	WATTS	VOLTAGE	PHASE	AMPERES	STACK LENGTH Inches	(mm)
60 HERTZ, 1800 r/min						
LK (RV)	2500	120/240	1	21/10.5	3.12	(80)
NB	3000	120/240	1	25/12.5	3.12	(80)
BF (RV)	4000	120/240	1	34/17	3.12	(80)
BF (Power Drawer)	4000	120	1	34	3.12	(80)
BFA (RV)	4000	120	1	34	3.12	(80)
BGA (RV)	5000	120/240	1	42/21	5.50	(140)
CCK	4000	120/240	1	34/17	3.12	(80)
MCCK	4000	120/240	1	34/17	3.12	(80)
CCK	5000	120/240	1	42/21	5.50	(140)
MCCK	6500	120/240	1	54/27	5.50	(140)
NH	6500	120/240	1	54/27	5.50	(140)
CCK	4000	120/208	3	11*	3.12	(80)
CCK	5000	120/208	3	14*	5.50	(140)
CCK	5000	120/240	3	12*	5.50	(140)
CCK	5000	277/480	3	6*	5.50	(140)
NH	6500	120/208	3	18*	5.50	(140)
NH	6500	120/240	3	15.5*	5.50	(140)
NH	6500	277/480	3	7.8*	5.50	(140)
NH	6500	120	1	50	5.50	(140)
50 HERTZ, 1500 r/min						
NB	2300	120/240	1	19/9.5	3.12	(80)
CCK	3500	120/240	1	30/15	3.12	(80)
MCCK	3500	120/240	1	30/15	3.12	(80)
CCK	4200	120/240	1	35/17.5	5.50	(140)
NH	5500	120/240	1	46/23	5.50	(140)
MCCK	5500	120/240	1	46/23	5.50	(140)
CCK	4200	120/240	3	10*	5.50	(140)
CCK	4200	220/380	3	6.4*	5.50	(140)
NH	5500	120/240	3	13.2*	5.50	(140)
NH	5500	220/380	3	8.4*	5.50	(140)

***Current rating for three-phase voltage only (higher nameplate rating).**
(RV) Special generator set model for recreational vehicles.

Meet all applicable code requirements. A qualified serviceman or electrician must install the genset, and the installation must be inspected and approved. Use flexible conduit and stranded load wires near the set, to absorb vibration. Strip enough insulation from the wire ends for clean connections.

The AC output box has openings for load wires (Figure 1-3). Connect each load wire to the proper generator output lead inside the AC output box (descriptions following). Insulate the bare ends of ungrounded wires. Install a fused main switch (or circuit breaker) between the generator set and the load.

⚠WARNING ***Electrical shock can cause severe personal injury or death. Check voltage at the main junction box to be sure power has been disconnected before attempting load wire disconnection/reconnection.***

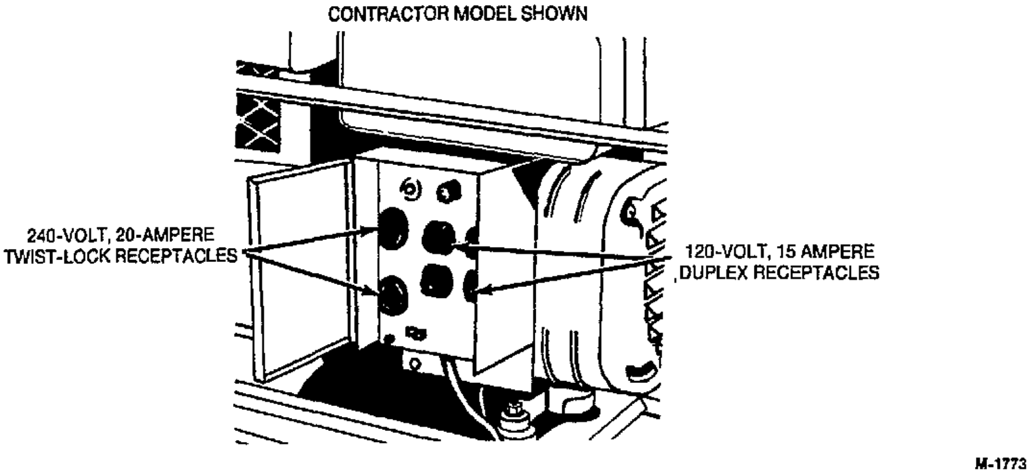


FIGURE 1-2. CONTRACTOR AND PORTABLE GENSETS

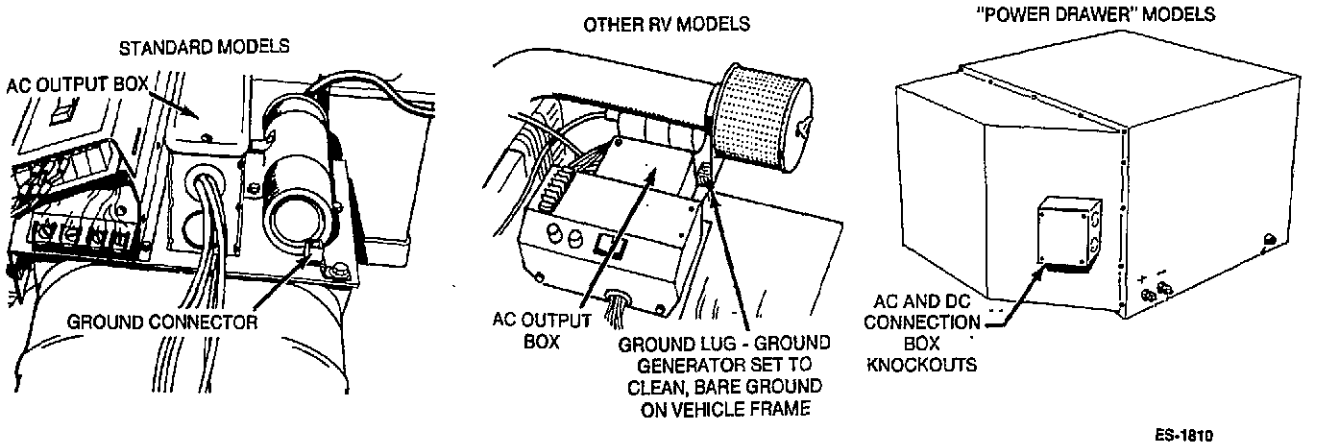


FIGURE 1-3. AC OUTPUT BOX LOCATION

Reconnectible Single-Phase Generator

⚠WARNING ***Electrical shock can cause severe personal injury or death. Check voltage at the vehicle junction box to be sure power has been disconnected before attempting load wire disconnection/reconnection. Reconnectible single-phase generators can supply the following voltages (Figure 1-4):***

120/240 volts, 3 wire
120 volts, 2 wire
240 volts, 2 wire

Use the connection for two-wire service when one load exceeds one-half rated capacity. Balance the load when connecting for three-wire service. Current for any one output lead must not exceed the nameplate rating. Serious overloading can damage the generator windings. When two or more single-phase circuits are available, divide the load equally among them.

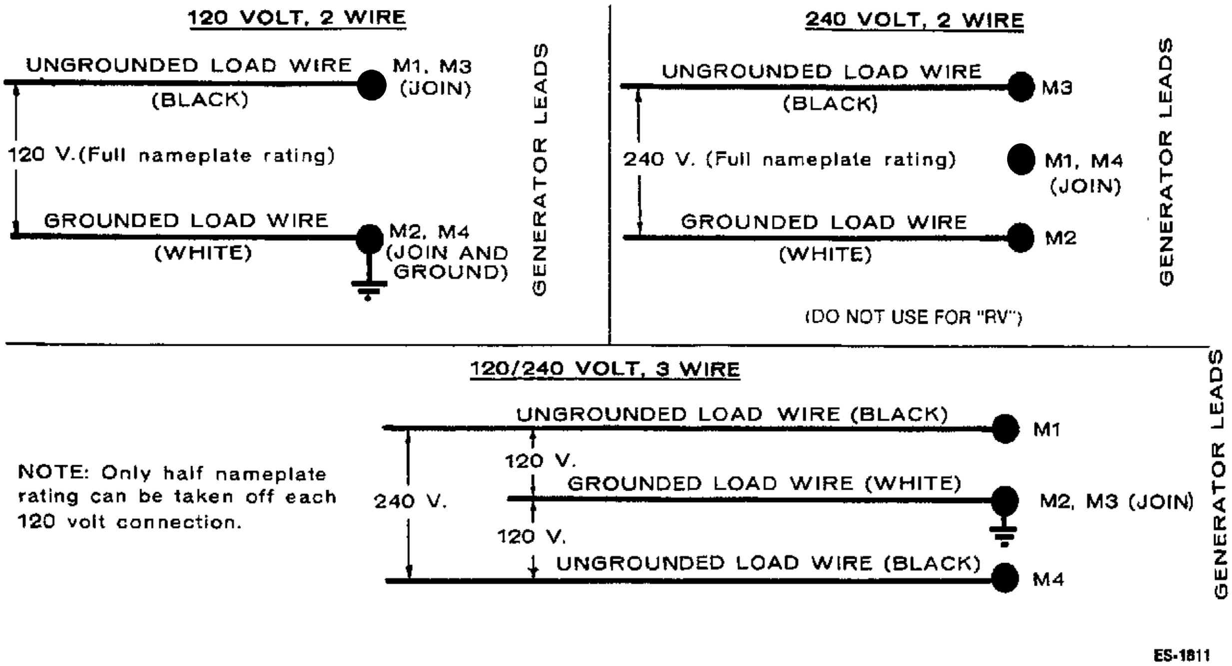


FIGURE 1-4. 120/240 VOLT RECONNECTIBLE GENERATOR LOAD CONNECTIONS

Three-Phase Delta Wound Generator 120/240 Volt (Code 5D)

⚠WARNING ***Electrical shock can cause severe personal injury or death. Check voltage at the main junction box to be sure power has been disconnected before attempting load wire disconnection/reconnection. Three-phase delta-connected generator sets can supply the following voltages (Figure 1-5):***

120-volt, single-phase current
240-volt, single-phase current
240-volt, three-phase current

For three-phase operation, connect the three load wires to the three terminals M1, M2 and M3, one wire per terminal. M0 is neutral, and is not used for three-phase operation.

Connect the "hot" (black) load wire to either M1 or M2 for 120-volt single-phase service. Connect the neutral (white) wire to M0. Two 120-volt circuits are available.

Do not use M0 and M3 as a 120-volt circuit.

For single-phase 240-volt service, connect the load between M1 and M2, or between M2 and M3, or between M1 and M3 (three circuits available). M0 is not used.

Any combination of single-phase and three-phase loading can be used if no one terminal current exceeds the generator nameplate rating. Single-phase loads as large as two-thirds of the three-phase rating may be used if no other load exists on the generator.

DELTA GENERATOR CONNECTIONS FOR VOLTAGE CODE -5D

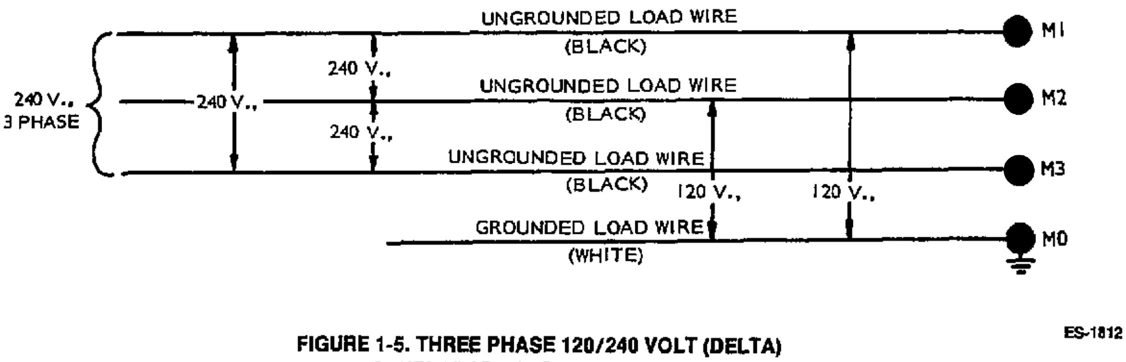


FIGURE 1-5. THREE PHASE 120/240 VOLT (DELTA) GENERATOR LOAD CONNECTIONS

Three Phase (Wye Connected) Generator
120/208 Volt (Code 4)
277/480 Volt (Code 4X)

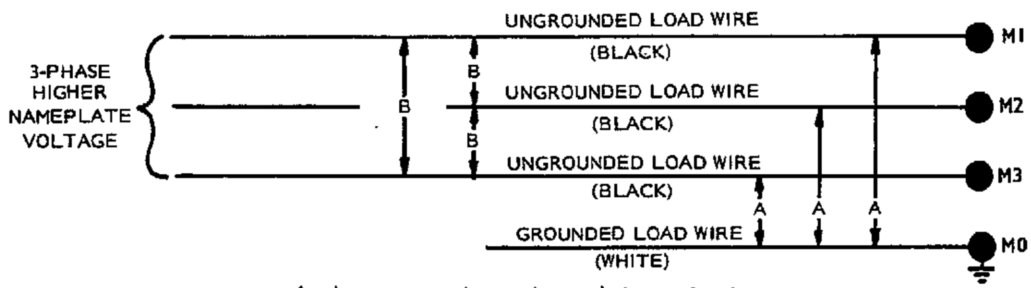
⚠WARNING ***Electrical shock can cause severe personal injury or death. Check voltage at the main junction box to be sure power has been disconnected before attempting load wire disconnection/ reconnection.***

Three-phase (wye-connected) generator sets produce single-phase voltage of the lower nameplate voltage (e.g. 120 volts) and three-phase voltage of the higher nameplate voltage (e.g. 208 volts). The M0 terminal is grounded. For single-phase current, connect the neutral (white) load wire to M0. Connect the "hot" (black) load wire to either M1, M2 or M3. Three separate single-phase circuits are available, each having no more than one-third the rated genset capacity from any one circuit.

For three-phase current, connect separate load wires to generator terminals M1, M2 and M3. Single-phase current is found between any two three-phase terminals. If using single-phase and three-phase current at the same time, take care to balance the single-phase load properly.

⚠CAUTION ***Continuous generator set overloading can cause high operating temperatures that could damage the generator windings. Use any combination of single-phase and three-phase loads, as long as the current in each load line of the generator does not exceed rated current.***

WYE GENERATOR CONNECTIONS FOR VOLTAGE CODES 4 (120/208) and 4X (277/480)



A - Lower nameplate voltage, 1 phase circuit.
B - Higher nameplate voltage, 1 phase circuit.

ES-1813

FIGURE 1-6. THREE-PHASE, FOUR WIRE (WYE) GENERATOR LOAD CONNECTIONS

Section 2. Generator

Onan Power Drawer gensets and controls are described in a separate section of this manual.

GENERATOR DISASSEMBLY

Before disassembling the generator, mark all leads and note their connection points. Figure 2-1 illustrates a typical generator parts breakdown.

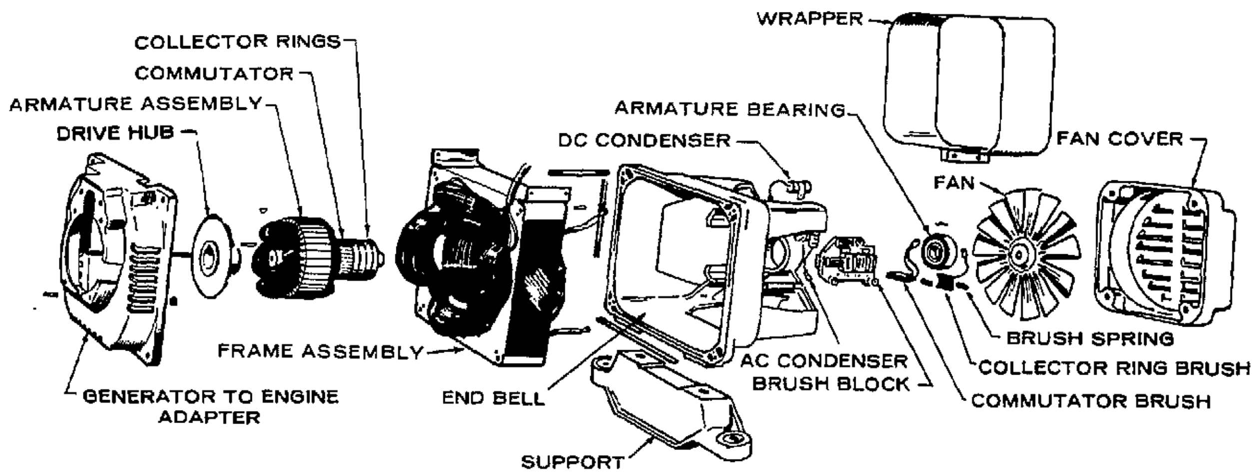
AWARNING ***Many service procedures present hazards which can result in severe personal injury, death, and/or equipment damage. Only qualified service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Review safety precautions on inside cover page.***

1. Disconnect the battery cables from the generator set, negative (-) cable first.

AWARNING ***Batteries present the hazard of explosion, which can result in severe personal injury. Because batteries produce explosive gas, do not smoke or allow any arc-producing devices in the battery area. To avoid excessive arcing, always disconnect the negative (-) cable first, and connect it last.***

AWARNING ***Inadvertent starting of the generator set can cause damage to the generator set, severe personal injury, or death. For this reason, do not reconnect the negative (-) battery cable until instructed to do so in this procedure.***

2. Remove the control leads and other electrical leads to the engine.
3. Disconnect the load wires from the generator output wires in the AC output box.
4. Remove all accessories attached to the generator.
5. Remove the generator fan cover and end bell wrapper.
6. Loosen and lift out the brush rigs, or use wooden dowels or alligator clips to hold the brushes out of the way, to remove the end bell.



M-1774

FIGURE 2-1. TYPICAL GENERATOR DISASSEMBLY (EARLY MODELS)

⚠CAUTION ***The brushes may be damaged during removal if not held off the slip rings. Make certain to hold the brushes out of the way before removing the generator end bell.***

7. Remove the generator fan, mounting nut and washer.

8. Remove all the generator wire leads from the end bell assembly.

9. Remove the four generator through-bolts.

10. Lift or pull the end bell from the frame assembly (do not pry with a screwdriver). Tap around the edges of the end bell with a plastic hammer.

11. Remove the frame assembly. Screwdriver slots in the engine-generator adapter enable the frame to be pried loose. Be careful not to let the frame rest or drag on the armature during removal.

12. While pulling outward on the armature with one hand, strike a blow on the end of the armature through-stud with the nut on the stud, to loosen the armature. Remove the armature and drive hub as a unit. Do not lose the key from the drive hub on the engine shaft.

    If the armature does not come loose, place a heavy brass rod on the armature shaft near the ball bearing and strike a sharp downward blow on the rod with a hammer. Rotate the armature 180° before repeating.

⚠CAUTION ***Inadvertently striking the commutator, collector rings or bearing can damage these parts severely. Use extreme care when performing this procedure.***

13. Remove the engine-generator adapter by removing the mounting screws.

GENERATOR TROUBLESHOOTING

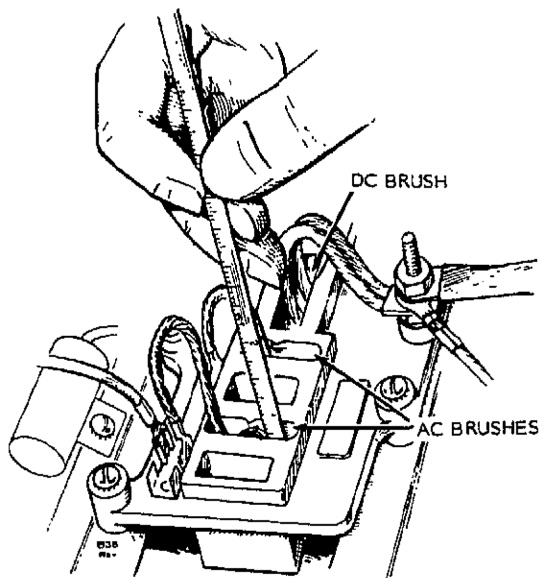
⚠WARNING ***Many troubleshooting procedures present hazards which can result in severe personal injury or death. Only qualified service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Review safety precautions on inside cover page.***

TROUBLE	POSSIBLE CAUSE	CORRECTIVE ACTION
NO AC VOLTAGE	1. Blown fuse or circuit breaker (if used)	1. Look for cause and repair. Then replace fuse or reset breaker.
	2. Disconnected wire or lead brushes.	2. Reconnect wire or wires.
	3. Brushes not making contact with collector rings.	3. Check brush springs for free movement or brushes which may be excessively worn.
	4. Open, grounded or short circuit in field or armature winding.	4. Test with ohmmeter or continuity tester and repair or replace as necessary.
LOW AC OUTPUT	1. External short circuit on line.	1. Locate and eliminate short circuit problem.
	2. Generator overloaded.	2. Remove part of load.
	3. Shorted or grounded circuit in field or armature winding.	3. Test with continuity tester or ohmmeter and replace if defective.
	4. Engine not running properly causing generator to slow down.	4. Refer to Engine Section-Troubleshooting.
NOISY GENERATOR	1. Defective bearing in end bell.	1. Replace bearing.
	2. Brush rig loose.	2. Retorque.
	3. Armature and field frame rubbing together.	3. Check generator alignment and clean air gap between arm and field of varnish lumps.
GENERATOR OVERHEATS	1. Generator overloaded.	1. Remove part of load.
	2. Windings and parts covered with oil or dirt.	2. Clean generator.
	3. Air intake restricted or incoming air too hot.	3. Take necessary steps to allow for proper cooling.
	4. Shorted, open or grounded circuit in armature or field windings.	4. Test with ohmmeter or continuity tester and replace if defective.

GENERATOR SERVICE PROCEDURES AND TESTS

Brush Replacement

Install new brushes when the old ones are worn to the dimensions shown in Figure 2-2. Replace the brush springs if they are damaged, or if their correct tension is doubtful.



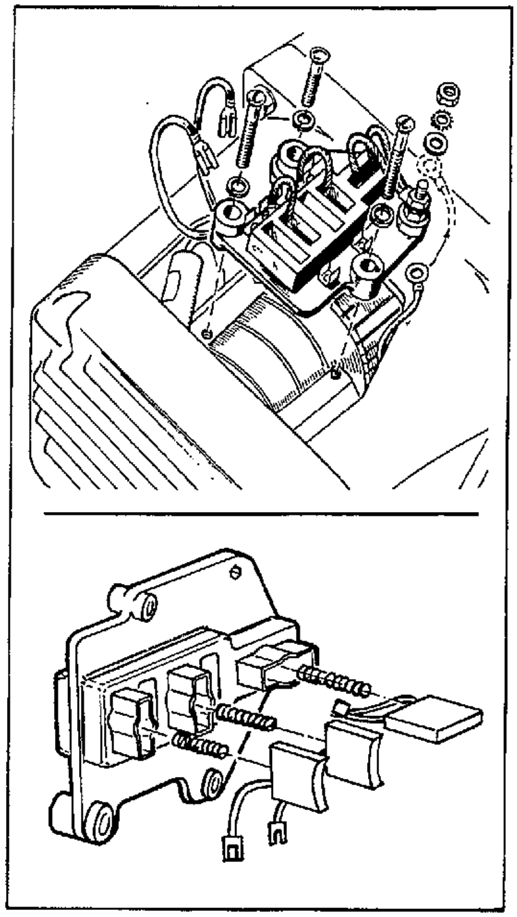
G-1217

MEASURE FROM TOP FACE OF BRUSH BLOCK TO TOP OF BRUSH

	DC	AC
NEW	5/8" (15.8 mm)	11/16" (17.5 mm)
½ WEAR	13/16" (20.6 mm)	7/8" (22.2 mm)
REPLACE	1" (25.4 mm)	1-1/16" (26.9 mm)

FIGURE 2-2. MEASURING BRUSH WEAR

1. Remove the generator end bell wrapper to expose the brushes.
2. Measure the brush wear.
3. Remove the three screws holding each brush block in place (Figure 2-3).
4. Remove the old brushes and clean the holders so the new brushes can move easily in their holders.
5. Install the new brushes.



G-1216

FIGURE 2-3. GENERATOR BRUSH REMOVAL

⚠CAUTION ***Using the wrong brush can damage or destroy the generator. Never substitute a brush which appears to be the same, because it may have different electrical characteristics. Always use the correct Onan brush (correct part number listed in parts catalog).***

6. Install the brush blocks and the generator end bell wrapper.

New brushes are shaped to fit, and seldom need sanding to fit properly. If brush sparking occurs, run the generator set with a light load until the brushes are properly seated.

Collector Rings and Commutator

If the collector rings are so grooved or pitted that good brush seating cannot be maintained, remove the armature and refinish the collector rings in a lathe. If the commutator appears rough or scored, refinish it at the same time.

⚠WARNING ***Incorrect use of a lathe or other power tools can cause severe personal injury, death, or equipment damage. Service personnel must be fully qualified to operate a lathe before attempting this service procedure. Wear eye and hand protection while performing this procedure.***

⚠CAUTION ***The lathe refinishing process can damage the ball bearing. Shield the ball bearing during refinishing to prevent damage.***

The commutator gradually wears with use. If the proper brushes have been used, and if they have been replaced at proper intervals, the commutator will wear slowly and evenly. In dusty conditions, or if the wrong brushes are used, wear occurs faster. Improper or excessive cleaning with sandpaper may cause the commutator to become grooved or out of round. If this condition exists, refinish the commutator in a lathe.

Lathe-Turning Collector Rings or Commutator

When a collector ring or commutator becomes grooved or pitted, turn it true in a lathe, as follows.

Remove the armature and center it on a lathe. Turn the commutator or collector ring just enough to provide a true concentric surface. Use #240 sandpaper to remove tool marks.

⚠WARNING ***Incorrect use of a lathe or other power tools can cause severe personal injury, death, or equipment damage. Service personnel must be fully qualified to operate a lathe before attempting this service procedure. Wear eye and hand protection while performing this procedure.***

After turning the slip rings, cut a slight chamfer on them to remove burrs and sharp edges. This reduces the possibility of a "flash over" between the rings. After the commutator is turned, undercut the mica insulation between the commutator bars as described in the paragraph *Undercutting the Mica Insulation.*

Undercutting the Mica Insulation: When the commutator wears down to the point that the mica insulation between bars contacts the brushes, the brushes will "jump", spark, operate noisily, and wear rapidly. This lowers the efficiency of the generator, and burns the commutator (Figure 2-4). When a "high mica" condition exists, or after the commutator has been turned on a lathe, the mica insulation must be undercut. A tool for this task is illustrated in Figure 2-4.

⚠CAUTION ***The undercutting process can easily damage the slip rings. Use extreme care not to draw the undercutting tool into the slip rings.***

To undercut the mica, center the cutting tool over the mica, and draw the tool the length of the commutator with a firm, steady pull. Repeat the cutting operation until the mica is removed to approximately 1/32 inch (0.8 mm) below the surface of the commutator.

When each section of mica is cut to the proper depth, proceed to the next section, until all are equally undercut. Carefully remove any burrs by holding a piece of #240 sandpaper against the commutator with a flat piece of wood, while the commutator turns rapidly.

⚠WARNING ***Contact with rotating machinery can result in severe personal injury. Wear eye protection and gloves, and use extreme care when performing this burr-removal procedure.***

Before returning the armature to service, blow or brush all mica dust, metallic particles, etc. from the commutator grooves and surface. Bevel the edges of the bars on the larger commutators.

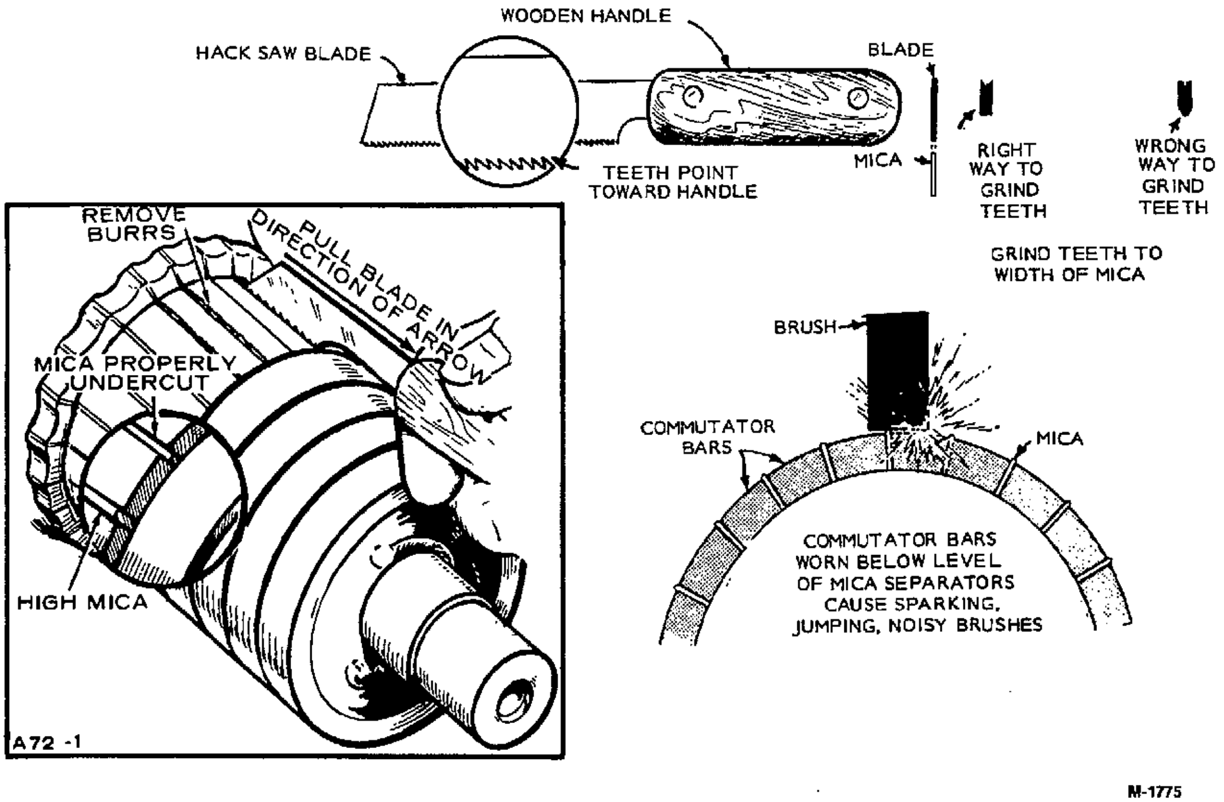


FIGURE 2-4. UNDERCUTTING MICA INSULATION

Testing Armature AC Windings - Continuity

Single Phase Models:

Using a Continuity Tester (6-volt Buzzer or Test Lamp): Continuity should exist between collector rings M1-M2, and between rings M3-M4. (On single-phase BFA models, continuity should exist only between M1 and M2.)There should be no continuity between M2-M3 (Figure 2-5).

Using an Accurate Ohmmeter: Resistances between collector rings M1-M2 and between M3-M4 should match values in Table 2-1. (On single-phase BFA models, measure resistance only between M1 and M2.)

TABLE 2-1.
SINGLE-PHASE ARMATURE RESISTANCES

VOLTAGE	kW	RESISTANCE
120/240	6.5	0.15 ohms
120/240	5.5	0.25 ohms
120/240	5.0	0.141 ohms
120	4.0	0.27 ohms
120/240	4.0	0.39 ohms
120/240	3.0	0.30 ohms
120/240	2.3	0.56 ohms

Three-Phase Models:

Using a Continuity Tester (6-volt Buzzer or Test Lamp): Continuity should exist between collector rings M1-M2, M2-M3, and M1-M3 (Figure 2-5).

Using an Accurate Ohmmeter: Resistances between collector rings M1-M2, M2-M3, and M1-M3 should match values in Table 2-2.

TABLE 2-2.
THREE-PHASE ARMATURE RESISTANCES

VOLTAGE	kW	RESISTANCE
120/208	6.5	0.20 ohms
120/208	4.0	0.49 ohms
120/240	6.5	0.40 ohms
120/240	5.5	0.76 ohms
120/240	4.0	1.28 ohms
277/480	6.5	0.76 ohms

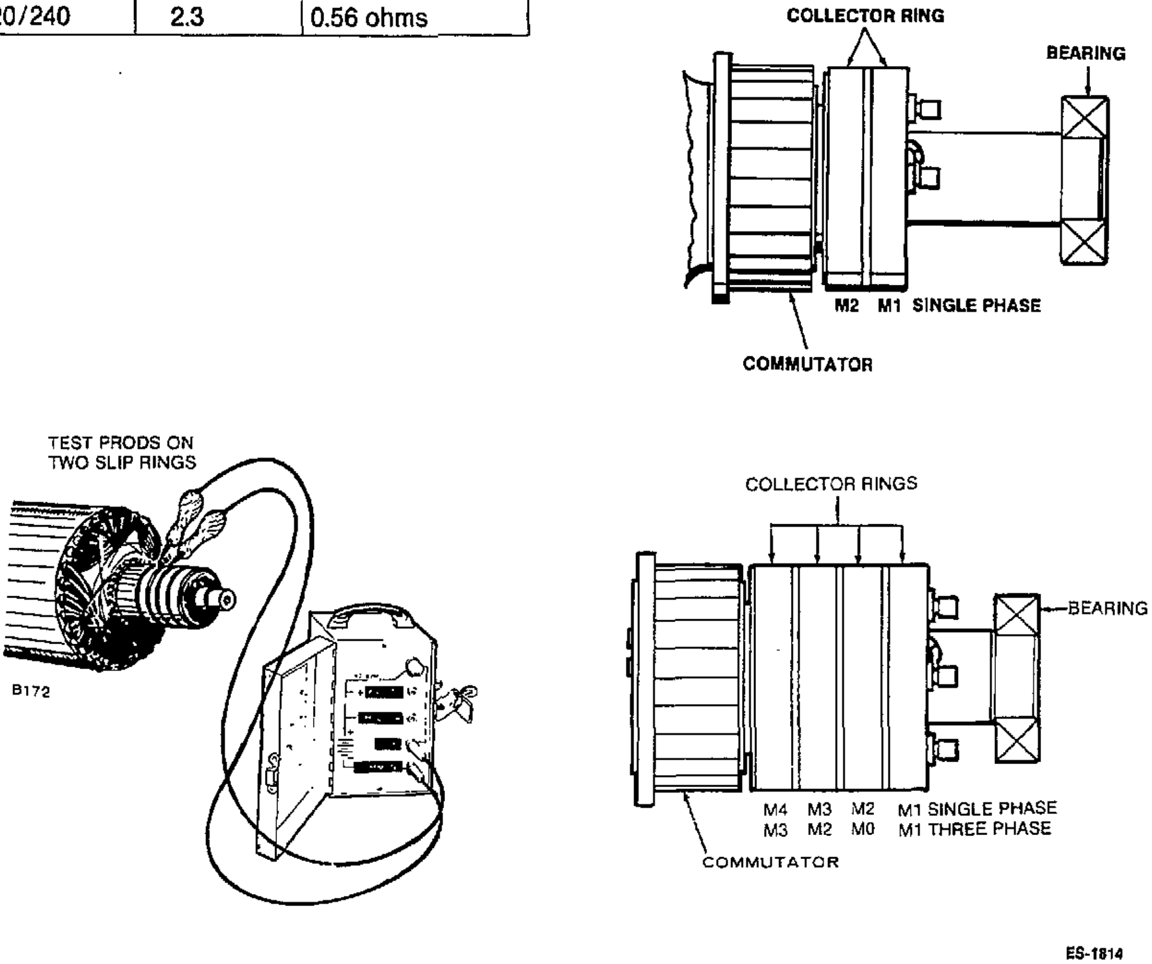


FIGURE 2-5. ARMATURE AC OPEN TEST

Testing DC Armature Windings

Open Circuit Test: Using a six-volt continuity tester, touch one prod to a commutator bar and hold it there. Touch the other prod to successive bars, working completely around the commutator. If the light does not glow and the buzzer does not buzz, there is an open DC winding. Replace the armature.

The growler can also indicate an open circuit. Place the armature in the growler and turn the current on. Pass a smooth steel strip across the commutator bars (Figure 2-6). Rotate the armature to check all bars and coils. A spark should occur between the commutator bars. No spark indicates an open coil. Replace the armature.

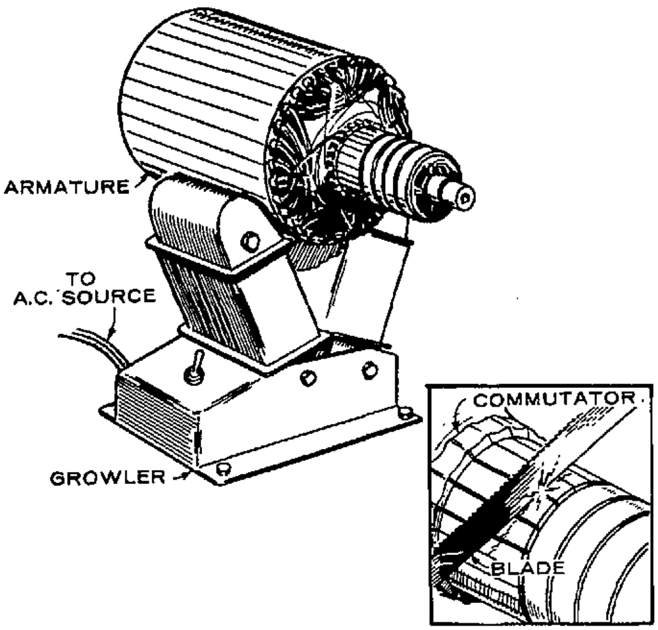


FIGURE 2-6. ARMATURE DC OPEN TEST WITH GROWLER

Armature Short Circuit Test

To test for a short circuit, place the armature in a growler (Figure 2-7). With the growler current on, hold a steel strip about ½ inch (13 mm) above the armature laminations. Pass the strip back and forth over the lamination. Cover as much of the lamination area as possible. If the strip is magnetically attracted to the armature at any point, this indicates a short circuit.

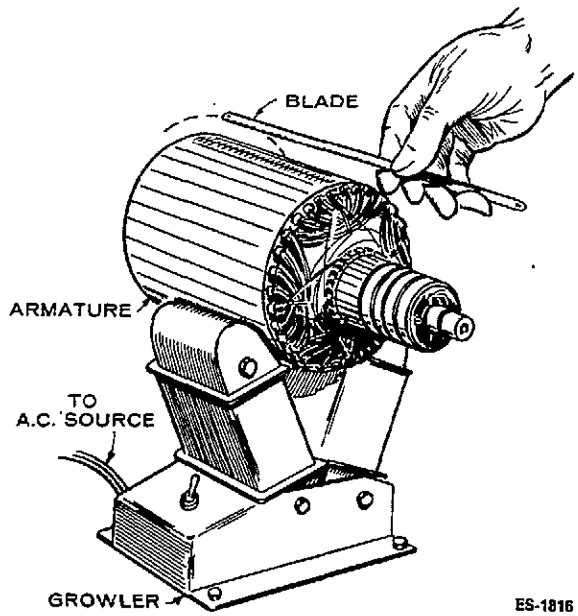


FIGURE 2-7. ARMATURE SHORT CIRCUIT TEST WITH GROWLER

After testing in one position, rotate the armature slightly in the growler and repeat the test. Continue until the armature is completely rotated in the growler. Replace a short-circuited armature with a new one.

The continuity tester may be used to test for a short circuit between AC and DC circuits of the armature. With one test prod contacting the commutator, contact the second test prod to the slip rings (Figure 2-8). If the lamp lights or buzzer sounds, a short circuit exists. Replace the armature.

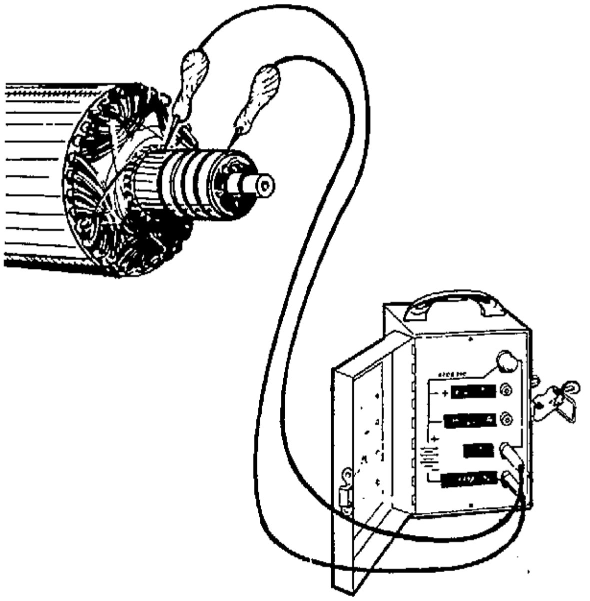


FIGURE 2-8. ARMATURE SHORT CIRCUIT TEST WITH CONTINUITY TESTER

Armature Ground Test

Use a continuity tester. To test the DC winding, place one test prod on the armature shaft and the other on a commutator bar (Figure 2-9). If the tester lights or buzzer sounds, a grounded circuit is indicated. Replace the armature.

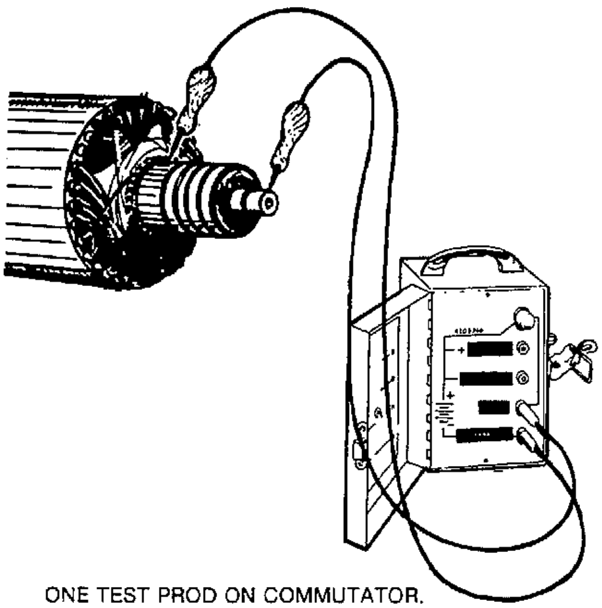


FIGURE 2-9. ARMATURE DC GROUND TEST

To test the AC winding, place one test prod on the armature shaft and the other prod to a slip ring (Figure 2-10). If the tester lights or buzzer sounds, a grounded winding or slip ring is indicated (repeat for each slip ring). Replace the armature.

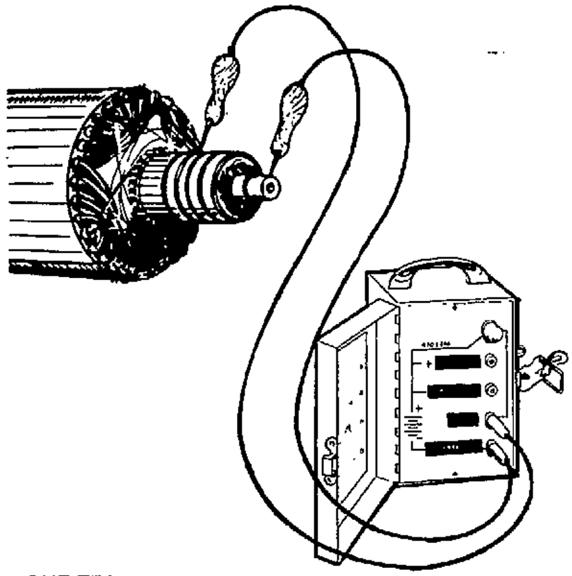


FIGURE 2-10. ARMATURE AC GROUND TEST

Field Winding Tests

The following tests can be performed without disassembling the generator. Disconnect the field coil leads from their terminal points on brush blocks and disconnect the S1 terminal from the start solenoid.

⚠WARNING ***Electrical shock can cause severe personal injury or death. Use extreme caution when working on electrical circuitry. Attach and remove meter leads only when generator set is not operating. Do not touch meter or meter leads during testing.***

If the frame assembly failure is an external lead between coils or the coil lead, the connection may easily be repaired. If the problem lies inside a coil, replace the entire frame assembly (wound stator). Figure 2-11 shows the wound stator assembly separated from the other generator components, to simplify the wire lead illustration.

DC field voltage during no-load operation for the LK is 17 volts, 27 to 33 volts for the CCK, MCCK, and NH.

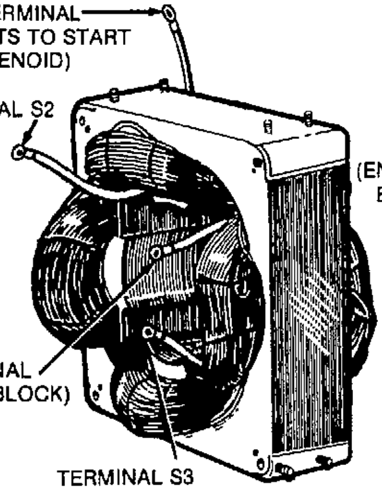


FIGURE 2-11. GENERATOR FRAME (WOUND STATOR) ASSEMBLY

To connect the voltmeter, first remove the wrapper from the end bell. With the generator set stopped, connect one voltmeter lead to the top commutator brush lead which goes to ground, and connect the other voltmeter lead to the commutator brush lead on the left. Start the generator set and note the DC field voltage. Stop the generator set, remove the voltmeter lead from the brush on the left side and connect it to the other commutator brush lead on the right side. Restart the generator set and check the DC voltage again. Stop the generator set when finished.

⚠WARNING ***Electrical shock can cause severe personal injury or death. Use extreme caution when working on electrical circuitry. Attach and remove meter leads only when generator set is not operating. Do not touch meter or meter leads during testing.***

Field Ground Tests

With an ohmmeter or continuity tester, touch one prod to each coil terminal and the other test prod to a clean, paint-free part of the generator frame. If the lamp lights or the ohmmeter shows continuity, replace the frame assembly.

Field Open Tests

Check the shunt winding resistance between S1 and F2. Table 2-3 lists field winding resistances. Measure the series winding resistances between S1 and S2, and S1 and S3. If resistance is high, an open circuit is likely, and the frame assembly should be replaced.

TABLE 2-3. FIELD WINDING RESISTANCES

GENERATOR SET	SHUNT WINDING	SERIES WINDING
LK	0.89	0.015
BK	1.82	0.019
BFA	1.00	0.019
BGA	1.88	0.014
CCK	1.48	0.014
MCCK	0.93	0.011
NB	0.67	0.016
NH	0.94	0.010

* - Resistance values ±5% at 77°F or 25°C. See *Generator* section in Service Manual 900-0196 for procedure.

TABLE 2-4. ROTOR/STATOR RESISTANCE VALUES

	RESISTANCE, OHMS @ 77° F (25° C)	
COMPONENT	4.0 MCCK–3CR	6.5 MCCK–3CR
ROTOR	0.194 TO 0.238	0.103 TO 0.127
STATOR (Shunt Field)		
F1–F2	15.23 to 16.17	15.33 to 16.27
F2–F3	3.81 to 4.04	3.83 to 4.07
F3–F1	11.42 to 12.13	11.50 to 12.20

GENERATOR ASSEMBLY

1. Clean and inspect all mating surfaces. The surfaces must be clean and smooth.
2. Coat the mating area between the generator shaft and the engine crankshaft with a thin film of lubricating oil.
3. Assemble the armature through-stud to the engine crankshaft with required torque.
4. Make certain that the key is in the crankshaft.
5. Slide the armature over the through-stud and onto the crankshaft, taking care not to let the weight of the armature rest on the through-stud.

⚠CAUTION ***Misalignment can shorten the life of the rear main and outboard bearings. It can also double cranking torque requirements, resulting in damage to the commutator and DC brushes. For this reason, do not tighten the armature or rotor through-stud before mounting the frame and end bell.***

6. Install the frame and end bell (with bearing).
7. Install the four generator through-bolts, washers, lockwashers and nuts. Tighten to the specified torque.
8. Install the generator fan cover.
9. Torque down the armature through-stud nut.
10. Tap the end bell in the horizontal and vertical planes with a lead hammer to relieve stresses on the components, then recheck the torque.
11. Install the generator fan cover.
12. Reconnect the wire leads to the engine.
13. Reinstall the battery cables.

⚠WARNING ***Arcing or inadvertent starting of the generator set can cause damage to the generator set, severe personal injury, or death. For this reason, do not reconnect the negative (-) battery cable until instructed to do so in this procedure.***

Section 3. Control System

OPERATION DESCRIPTION

This manual section is divided into five parts, corresponding to the different types of controls used with the UN generators. Table 3-1 indexes the operation descriptions for the different types of controls. Troubleshooting procedures are described in Section 4 of this manual.

NOTE: Section 5 of this manual describes the generators and controls of the Onan "Power Drawer" gensets.

TABLE 3-1.
INDEX OF CONTROL SYSTEM DESCRIPTIONS

UNIT	PAGE
NB	3-1
MCCK (Spec D) NH (Spec A through C)	3-2
CCK (Spec R) MCCK (Begin Spec E) NH (Spec D through F)	3-4
BF CCK (Begin Spec U) LK (Begin Spec M) NH (Begin Spec J)	3-6
BFA (Spec A) BGA (Spec A) NH (Spec K)	3-7
MCCK (Spec H)	3-8

NOTE: When relay operation is described, "N.O." refers to normally open relays, and "N.C." refers to normally closed relays.

NB MODELS

STARTING

When switch S1 is moved to START (Figure 3-1), battery negative (-) is connected to start solenoid relay K1. (Battery positive B+ is already present.) Relay K1 closes its N.O. contacts to connect B+ to the series field cranking windings of the generator. K1 also connects B+ to stop relay K2. The N.O. contacts of K2 close to connect B+ to ignition coil T1 and breaker points S2. Solenoid K4 energizes to release gaseous fuel to the engine, or electric fuel pump E2 operates to pump gasoline to the engine.

IGNITION

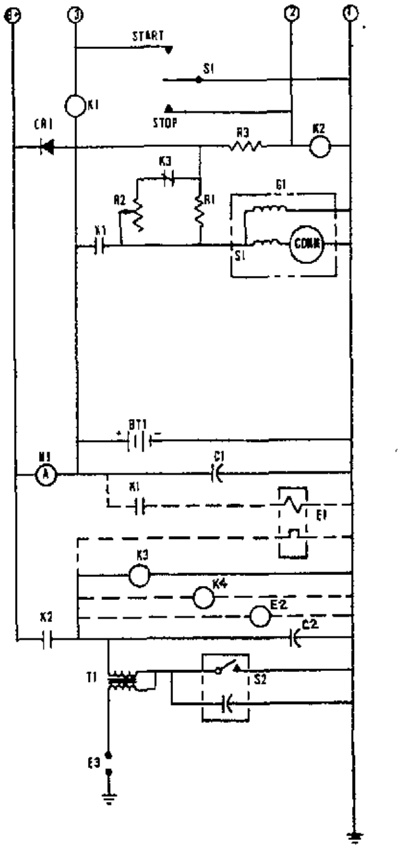
The generator acts as a motor to crank the engine. If ignition voltage and fuel are present, the engine starts, and attains rated speed. After starting, the start switch can be released, because generator voltage is connected through resistor R1 to keep relay K2 energized, connecting voltage through R1 and diode CR1 to ignition coil T1 and breaker point assembly S2 to keep the engine running.

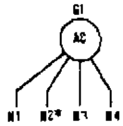
BATTERY CHARGING

The two-stage battery charging circuit provides a continuous low-current charge from the generator through resistor R1, diode CR1, and ammeter M1 to battery BT1. If this charging rate is too low, the circuit automatically switches to a higher rate, as follows. Voltage regulator relay K3 receives too low a voltage to energize, so its N.C. contacts remain closed, allowing generator current to pass through resistor R2, K3 contacts, diode CR1, and to the battery. When the battery is fully charged, enough voltage is present to energize K3, opening its contacts to remove the high charge rate from the circuit.

STOPPING

Moving switch S1 to STOP grounds the positive side of stop relay K2. K2 deenergizes, opening its contacts to remove B+ from the primary side of the ignition coil. This prevents a make and break of the ignition primary, to eliminate the spark at the plug, stopping the engine.





BT1...... Battery
CR1 ..... Reverse Current Diode
E1 .... Electric Choke
E2 .... Fuel Pump (When Used)
E3 .... Spark Plug
G1....... Generator
K1 .... Start Solenoid Relay
K2 .... Stop Relay
K3 .... Two-Step Voltage Regulator Relay
K4 .... Gas Solenoid (When Used)
M1....... Charge Ammeter
R1,R2,R3. Resistor
S1 .... Start-Stop Switch
S2 .... Breaker and Cap Assembly
T1 .... Ignition Coil

FIGURE 3-1. TYPICAL SCHEMATIC FOR NB

MCCK (SPEC D) AND NH (SPEC A THROUGH C) MODELS

This description refers to an NH generator set, but applies for the most part to the Spec D MCCK generator set as well. See Figure 3-2.

STARTING

When switch S1 is moved to START, battery negative (-) is connected through switch S1, closed K4 contacts, and start disconnect relay assembly K4 terminals 6 and 7, to start solenoid relay K1. The N.O. contacts of K1 are closed to connect B+ to the choke, and to connect B+ to the series field windings of the generator and stop relay K2. K2 closes its N.O. contacts to connect B+ to the two-step voltage regulator relay K3, to the fuel pump or gas valve E2 (if used), and to ignition coil T1 and breaker points assembly S2.

IGNITION

The generator acts as a motor and cranks the engine. If ignition voltage and fuel are present, the engine starts and reaches rated speed. Generator DC output, after reaching 10 to 11 volts, energizes the transistor in start disconnect relay K4 assembly, which connects ground to start disconnect relay K4. K4 remains energized during genset operation, holding its N.O. contacts closed to keep stop relay K2 energized, and providing voltage for the ignition circuit and battery charging through ammeter M1. The N.C. contacts of K4 are opened at this time, breaking the start signal from switch S1 and start solenoid K1. Optionally, another set of K4 contacts are closed, connecting B+ to the choke and its heating element (when used).

To test the start disconnect relay, check the coil resistance (20 to 24 ohms) and the contact operation when the unit starts.

BATTERY CHARGING CIRCUIT

The generator DC windings supply battery charging current through adjustable charge rate resistor R2, start disconnect relay K4 contacts, and ammeter M1 to battery BT1. The slider on R2 adjusts the charge rate between two and five amperes.

AUTOMATIC EMERGENCY STOPPING

The emergency stopping system consists of two devices; the high temperature cut-off and the low oil pressure cut-off.

The optional high air temperature switch (S3 in Figure 3-2) for the NH generator set closes during high temperatures, grounding the coil side of the ignition points, to stop the engine. A high water temperature shutdown on MCCK marine generator set also shuts down the engine for high water coolant temperature, by opening to remove B+ from the ignition coil.

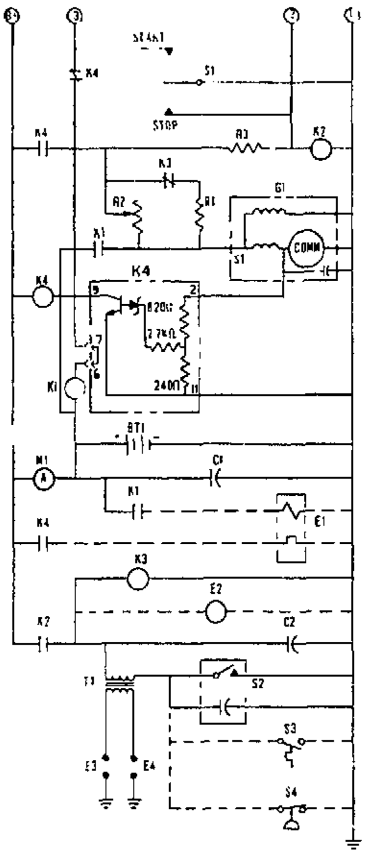
A low oil pressure circuit (optional on the NH) includes a non-adjustable low oil pressure switch (shown as S4 in Figure 3-2). This switch closes if low oil pressure occurs, grounding the ignition breaker points. On the MCCK, this switch closes during low oil pressure conditions, but connects ground to a low oil pressure relay, which opens contacts that remove B+ from the ignition coil.

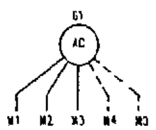
When the genset is used with an automatic transfer switch or automatic demand control and one of the emergency stopping devices operates, the engine stops, then cranks until the control cranking limiter opens.

STOPPING

Moving switch S1 to STOP grounds the positive side of stop relay K2. K2 deenergizes, opening contacts that remove B+ from the primary side of the ignition coil. This eliminates spark at the plugs, stopping the engine.

The six-volt stop relay is used in series with the 30-ohm voltage drop resistor. Coil resistance of the stop relay is roughly 30 ohms. If a problem arises, check the resistance, inspect the contacts, and check contact operation when voltage is applied to the coil.





BT1 ...... Battery
E1 .... Electric Choke (When Used)
E2 .... Fuel Pump or Gas Valve (When Used)
E3,E4 .... Spark Plug
G1 .... Generator
K1 .... Start Solenoid Relay
K2 .... Stop Relay
K3 .... Two-Step Voltage Regulator Relay
K4 .... Start Disconnect Relay Assembly
M1 .... Charge Ammeter
R1,R2,R3 . Resistor
S1 .... Start-Stop Switch
S2 .... Breaker and Cap Assembly
S3 .... High Air Temperature Switch (When Used)
S4 .... Low Oil Pressure Switch (When Used)
T1 .... Ignition Coil

FIGURE 3-2. TYPICAL SCHEMATIC FOR NH

CCK (SPEC R), MCCK (BEGIN SPEC E), AND NH (SPEC D THROUGH F) MODELS

This description refers to CCK and NH generator sets, but applies for the most part to the MCCK generator set (begin Spec E) as well. See Figure 3-3.

STARTING AND IGNITION

Controls With 300-1227 Start Disconnect Adapter

Switch A1S2, when moved to START, (Figure 3-3), closes a circuit through diode A1CR1 and switch A1S1 to terminal 6. This energizes ignition coil T1 and either electric fuel pump E1 or fuel solenoid K2, for gasoline or gaseous fuel, respectively.

When switch A1S2 closes, it places B+ on terminal 16 of start disconnect adapter A3. Transistor A3Q1 is energized, and connects B+ to start solenoid K1. K1 contacts close, connecting B+ to the generator. The generator acts as a motor and cranks the engine. If ignition voltage and fuel are present, the engine starts and accelerates to governed speed. On some models, the start solenoid K1 also energizes a choke.

For generator sets with a three-wire start adapter A2, moving the switch to START energizes relay A2K2, which closes contacts A2K2. This connects B+ to terminal 16 and start disconnect adapter A3, which energizes start solenoid K1.

***A1F1 FUSE (USED ON EARLIER MODELS)**

Later models use a 9 ampere in-line fuse (F1) for protecting board against reverse battery connections. This fuse is located in wiring harness between terminal 5 and battery.

- A1 .... Generator Set Control Assembly
- A2 .... Start Adapter Control (4 to 3 wire)
- A3 .... Disconnect Adapter Control
- BT1...... Battery
- E1 .... Fuel Pump or Gas Valve (When Used)
- E2,E3 .... Spark Plug
- E4 .... Electric Choke (When Used)
- G1 .... Generator
- K1 .... Start Solenoid Relay
- K2 .... Fuel Solenoid (When Used)
- S1 .... Low Oil Pressure Switch (When Used)
- S2 .... High Air Temperature Switch (When Used)
- S3 .... Breaker and Cap Assembly
- S4 .... Remote Start-Stop Switch (Customer Remote)
- S5 .... Vacuum Switch (When Used)
- T1 .... Ignition Coil
- A1S1..... Hand Crank - Electric Start Switch
- A1S2..... Start-Stop Switch

Controls Without Start Disconnect Adapter

Switch A1S2, when moved to START, closes a circuit through diode A1CR1, switch A1S1 and to terminal 6. This energizes ignition coil T1, electric fuel pump E1 (when used), and fuel solenoid K2 (when used).

When switch A1S2 closes, transistor A1Q2 turns on, energizing terminal 9 and start solenoid K1. K1 contacts close, connecting the battery to the generator, which acts as a motor and cranks the engine. If proper coil voltage and fuel are available, the engine starts and accelerates to governed speed. On some models, start solenoid K1 also energizes a choke.

For generator sets with a three-wire start adapter A2, moving the switch to START energizes relay A2K2, closing its contacts. This places B+ on terminal 16, connecting through transistor A1Q2 to start solenoid K1.

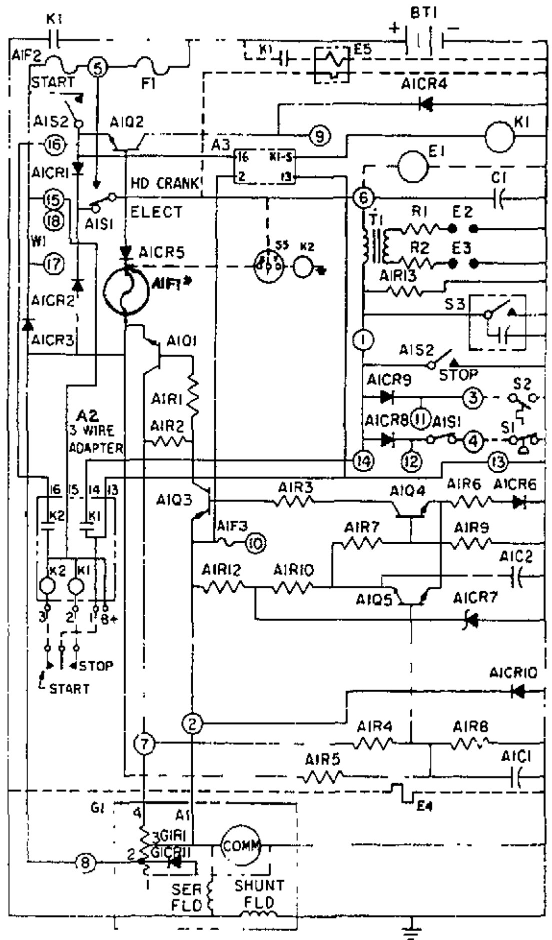


FIGURE 3-3. TYPICAL SCHEMATIC FOR CCK (SPEC R) AND NH (SPEC D THROUGH F)

START DISCONNECT

Controls With 300-1227 Start Disconnect Adapter

When the engine starts, generator DC voltage supplied to terminal 2 turns on transistor A3Q3 of the start disconnect adapter and turns off transistors A3Q1 and A3Q2. Start solenoid K1 is deenergized and breaks the starting circuit. At the same time, the generator output at terminal 8 supplies current through diode A1CR2 through switch A1S1, to ignition coil T1 and either electric fuel pump E1 or fuel solenoid K2 (gasoline or LPG-fueled sets respectively).

Controls Without Start Disconnect Adapter

When the engine starts, generator DC voltage supplied to terminal 8 causes A1CR5 to stop conducting, and turns off transistor A1Q2. This deenergizes start solenoid K1 and breaks the starting circuit. At the same time, the generator output at terminal 8 supplies current through A1CR2 diode, to ignition coil T1, and electric fuel pump E1 or fuel solenoid K2.

BATTERY CHARGING

The two-step battery charging circuits (Figure 3-3) provide either a continuous low 1.5-ampere or a high 5.26-ampere charge rate.

The low charge circuit (about 1.56 amperes) from generator G1 passes through charge resistor G1R1 (8.3 ohm side) terminal 2, control terminal 8, through A1CR3, control terminal 5, through fuse A1F2, and fuse F1 to the battery.

The high charge circuit (about 3.7 amperes) goes through charge resistor G1R1 (3.8 ohm side), terminal 4, control terminal 7, transistor A1Q1, diode A1CR3, fuse A1F2, control terminal 5, and fuse F1 to the battery. Together the low and high charge circuits provide roughly 5.26 amperes during high charging periods. The high charging circuit switches on each time the generator set is started, and switches off when the battery is almost fully charged. Blocking diode A1CR3 prevents the battery from discharging when the generator is stopped.

High Charge Rate Control Circuit

Battery voltage and switching transistors A1Q1, A1Q3, A1Q4, and A1Q5 control the high charge rate control circuit (Figure 3-3). This circuit switches on when battery voltage drops to 13 volts, automatically turning off transistor A1Q5. This action turns on A1Q4, which then turns on A1Q3. This turns on A1Q1, which completes the high charge circuit to the battery for charging at the high rate.

The circuit switches off when battery voltage rises to 15 volts, automatically turning on transistor A1Q5. This action turns off A1Q4 which then turns off A1Q3. This turns off A1Q1, which opens the high charge circuit to the battery, to stop charging at the high rate.

STOPPING

The generator set stops when switch A1S2 is moved to the STOP position. This switch grounds the point side of the coil, preventing a make and break of the ignition primary, cutting off spark to the plugs. At the same time, the battery is prevented from discharging through the generator by A1CR3 diode.

On generator sets with a three-wire adapter A2, moving the switch to STOP energizes relay A2K1, and A2K1 contacts close which ground terminal 14, the point side of the coil, etc.

BF, CCK (BEGIN SPEC U), LK (BEGIN SPEC M), AND NH (BEGIN SPEC J) MODELS

This operation description applies to all the series listed above except the Spec A series BF. The Spec A BF operates identically, except that it does not have a separate crank ignition relay for the ignition circuit (see *Wiring Diagrams* section).

STARTING

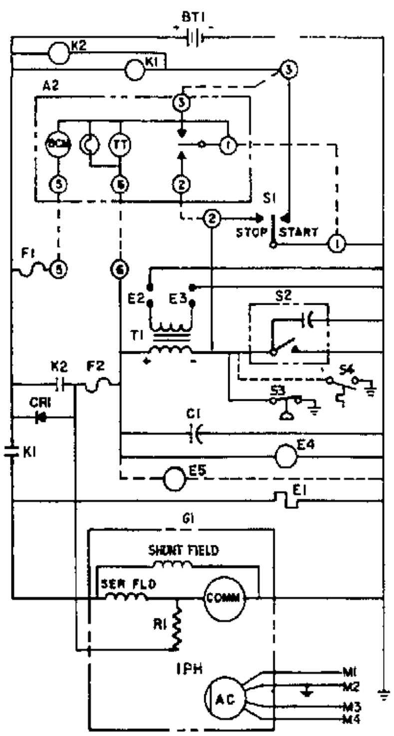
When switch S1 is moved to START (Figure 3-4), battery negative (-) is connected through switch S1 to start solenoid K1 and crank ignition relay K2. Start solenoid relay K1 closes its N.O. K1 contacts to connect B+ to the series field cranking windings of the generator. Ignition relay K2 closes its N.O. K2 contacts to connect B+ to ignition coil T1, breaker points assembly S2, and electric fuel pump E4 or fuel solenoid E5. E5 opens the fuel line to permit gaseous fuel flow from the fuel pump to the carburetor.

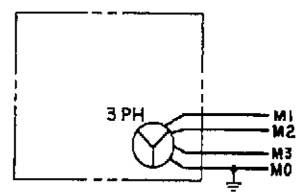
IGNITION

The generator acts as a motor to crank the engine. If ignition voltage and fuel are present, the engine starts and reaches rated speed. At this time, the operator can release the start switch, because the generator, through resistor R1 and fuse F2, supplies voltage to fuel solenoid E5, ignition coil T1, and breaker point assembly S2. It also supplies voltage through diode CR1 to recharge and maintain the battery. Generator voltage also operates the Onan electric choke E1, which slowly opens as the engine runs.

STOPPING

Moving switch S1 to STOP connects battery ground to terminal 2, to ground the point side of the ignition coil. This prevents a make and break of the ignition primary, to eliminate spark at the plugs. As the engine stops, blocking diode CR1 prevents battery discharge through the generator.





A2 .... Deluxe Remote Control
BT1...... Battery
E1 .... Electric Choke
E2,E3 .... Spark Plug
E4 .... Fuel Pump (When Used)
E5 .... Fuel Solenoid (When Used)
G1....... Generator
K1 .... Start Solenoid
K2 .... Crank Ignition Relay
S1 .... Start-Stop Switch
S2 .... Breaker and Cap Assembly
S3 .... Low Oil Pressure Switch (When Used)
S4 .... High Air Temperature Switch (When Used)
T1 .... Ignition Coil

FIGURE 3-4. TYPICAL SCHEMATIC FOR BF (BEGIN SPEC B), CCK (BEGIN SPEC U), LK (BEGIN SPEC M), AND NH (BEGIN SPEC J)

BFA (SPEC A), BGA (SPEC A) AND NH (SPEC K) MODELS

STARTING

When start-stop switch S1 is moved to "START" (see schematic), ground is connected from the battery through switch S1 to start solenoid K1 and crank ignition relay K2. Start solenoid relay K1 closes its normally-open contacts to connect battery positive to the series field cranking windings of the generator and to the electric choke E1. Crank ignition relay K2 closes its normally-open contacts to connect battery positive through ignition fuse F2 to electric fuel pump E4 and ignition coil T1. The fuel pump begins to pump fuel to the carburetor.

SCHEMATIC

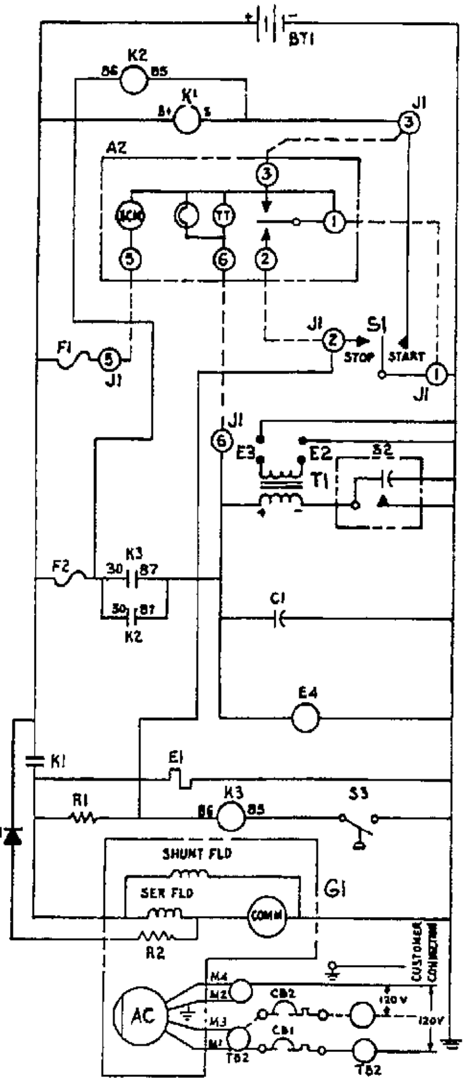


FIGURE 3-4. TYPICAL SCHEMATIC FOR BFA, BGA, AND NH (SPEC K)

IGNITION

The generator acts as a motor and cranks the engine. If sufficient ignition voltage and fuel are present, the engine starts and reaches rated speed. Generator output energizes run ignition relay K3 which connects B+ to ignition coil T1 and fuel pump E4. This enables the operator to release start-stop switch which causes start solenoid K1 and crank ignition relay K2 to de-energize. Generator output also supplies a voltage through diode CR1 to recharge and maintain the battery, and to operate the Onan choke E1 (which slowly opens as the engine continues to run).

STOPPING

Moving start-stop switch S1 to "STOP" connects battery ground to run ignition relay K3 and resistor R1. Relay K3 is de-energized and opens its normally-open contacts to remove battery positive from fuel pump E4 and ignition coil T1. This prevents a make and break of the ignition primary to eliminate spark at the plugs and stop the engine. After the engine stops, blocking diode CR1 prevents battery discharge through the generator.

A2	Deluxe Remote Control
BT1	Battery
E1	Electric Choke
E2, E3 ...	Spark Plug
E4	Fuel Pump
G1	Generator
K1	Start Solenoid Relay
K2	Crank Ignition Relay
K3	Run Ignition Relay
R1, R2 ...	Resistor
S1	Start-Stop Switch
S2	Breaker and Cap Assembly
S3	Low Oil Pressure Switch
T1	Ignition Coil
CB1	Circuit Breaker

MCCK SPEC "H" MODELS

STARTING

When switch S1 is moved to the START position, the ground circuit is completed for start solenoid coil K1 and crank ignition relay coil K2. Battery current flows through fuse F2 (5A), relay coil K2, normally closed contacts of K3 (run ignition, start disconnect relay), and relay coil K1 to ground.

Solenoid contacts K1 close and connect B+ to starter motor B1, which cranks the engine. The contacts of relay K2 close, connecting B+ to the ignition circuit and fuel pump E4.

IGNITION

During cranking, battery ignition current is conducted by the relay contacts of K2. As the engine starts and oil pressure switch S3 closes, relay K3 is energized by current build-up in the generator field. Relay contacts K3 open cranking solenoid K1 (cranking stops), and complete the "run ignition" circuit (K2 contacts are open when start switch is released).

The ignition current flows through resistor R3 (1.72 ohm), high water temperature switch S5, feedthrough capacitor C1, ignition coil T1 and the breaker assembly to ground.

Run ignition start disconnect relay K3 gets its operating current from a tap on the generator shunt field. The circuit is completed by resistor R1 (100 ohm), oil pressure switch S3 and the normally closed contact of stop relay K4.

BATTERY CHARGING AND CHOKE HEATER CIRCUIT

Choke heater E5 is connected in series with the battery charging circuit. Power is taken from the generator 120-volt AC winding M1, M2. The AC current is rectified by diode CR2 and flows through resistors R4 and R5 (7.5 ohm each), fuse F3 (3A), choke heater E5 (40 ohm), resistor R2 (25 ohm) and fuse F2 (5A). The circuit components limit the charging current to about one ampere.

Fuse F3 protects the battery charging circuit. If blown, the battery will not receive any charging current, and the carburetor choke will not open, resulting in poor engine performance after warm-up.

STOP CIRCUIT

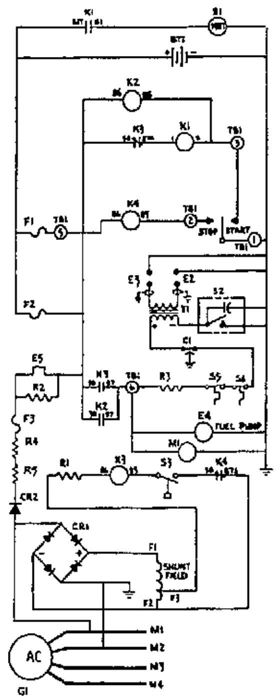
When switch S1 is held in the STOP position, current flows from B+ through the coil of relay K4, to ground. K4 energizes and opens the circuit to K3, which breaks the ignition circuit. With the ignition current cut off, the generator set stops.

BATTERY CHARGING DIODE

CR2 rectifies the AC power from the generator, preventing battery discharge through the generator on shutdown. The diode replaces the reverse current relay used on some earlier models.

SHUNT FIELD BRIDGE RECTIFIER CR1

Diode bridge CR1 is located on the top brush holder of the generator. It rectifies AC power from generator terminals M1 and M2, and supplies DC current for energizing the generator shunt field. At normal operating conditions, field voltage measured between F1 and F2 is 100 to 110 volts DC. If there is no generator output, check CR1 as a possible fault. The residual magnetism may need restoring, as shown in Figure 3-6.



A2	Deluxe Remote Control
A3	Standard Remote Control
BT1	Battery
B1	Starter Motor
C1	Condenser Assembly
CR1	Bridge Rectifier
CR2	Silicon Rectifier
E2, E3	Spark Plug
E4	Fuel Pump
E5	Electric Choke
F1, 2	Fuse (5 amp, 32 V)
F3	Fuse (3 amp)
G1	Generator
K1	Start Solenoid Relay
K2	Crank Ignition Relay
K3	Run Ignition Relay
K4	Stop Relay
R1, R2 R3, R4, R5	Resistor
S1	Start/Stop Switch
S2	Breaker and Cap Assy. Switch
S3	Low Oil Pressure Switch
S5	High Water Temperature Switch
T1	Ignition Coil
TB1	Terminal Block
TB2	Terminal Block

FIGURE 3-5. TYPICAL SCHEMATIC FOR MCCK SPEC "H" GENERATOR SETS

RESTORING RESIDUAL MAGNETISM

Residual magnetism in shunt field F1 may be lost if diode bridge CR1 fails, or if the shunt field is replaced. This renders the genset inoperative. The set will not operate because start-disconnect relay K3 is not energized.

Residual magnetism is restored through the following procedure:

1. Remove the generator end bell wrapper and locate the CR1 bridge rectifier on the top brush holder.
2. Make a jumper lead containing a 12-ampere 300 volt diode and a 20 ohm 10 watt resistor in series as shown. Observe diode polarity. The lead must reach from the genset B+ terminal to the positive terminal of bridge rectifier CR1. Install clips at each end, and insulate bare wires and connections.
3. Connect the diode end of the jumper lead to the genset B+ terminal, and the resistor end to the positive (+) terminal of the bridge rectifier. Maintain the connection for 5 seconds maximum.
4. Remove the jumper lead connections and test genset operation. Replace the end bell wrapper.

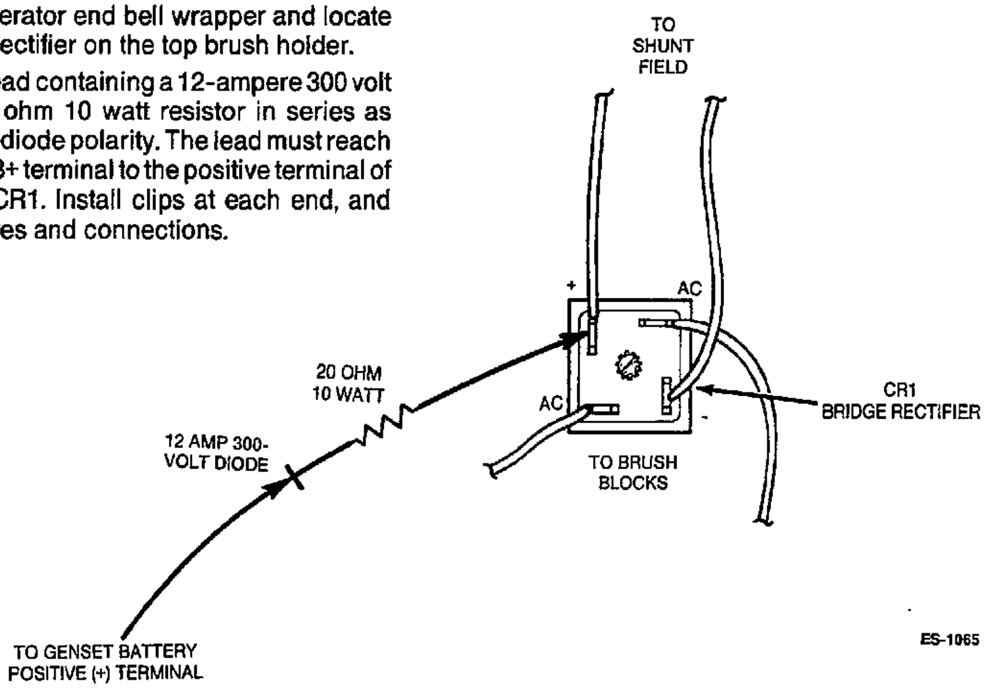


FIGURE 3-6. RESTORING RESIDUAL MAGNETISM

Section 4. Troubleshooting

This section is divided into five parts, corresponding to the types of control circuitry used with the UN generator. An index for this section is shown below.

⚠WARNING ***Many troubleshooting procedures present hazards which can result in severe personal injury, death, and/or equipment damage. Only qualified service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Review safety precautions on inside cover page.***

UNIT	PAGE
NB	4-1
MCCK (Spec D) NH (Spec A through C)	4-5
CCK (Spec R) MCCK (Begin Spec E) NH (Spec D through F)	4-9
BF CCK (Begin Spec U) LK (Begin Spec M) NH (Begin Spec J)	4-16
BFA (Spec A) BGA (Spec A) NH (Spec K)	4-20

NB MODELS

To correct a problem, answer the question in the appropriate troubleshooting chart either YES or NO. Refer to the number in that column and proceed to that step.

Use the wiring diagrams (see *Wiring Diagrams* section) to locate terminals, relays, etc. Figure 4-1 shows some of the control components for the NB model generator sets.

⚠WARNING ***Many troubleshooting procedures present hazards which can result in severe personal injury, death, and/or equipment damage. Only qualified service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Review safety precautions on inside cover page.***

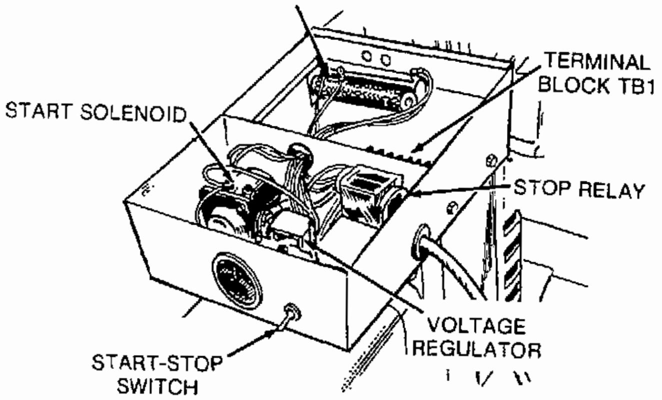


FIGURE 4-1. NB GENERATOR SET CONTROL

PROBLEM	SEE PAGE
A. Engine does not crank.	4-2
B. Engine cranks but does not start.	4-2
C. Engine starts but stops when start switch is released.	4-3
D. Generator set is running - then stops.	4-3
E. Low battery - no high charge rate.	4-4

A.	ENGINE DOES NOT CRANK	YES	NO
1.	Check battery. Are battery cables tight?	2	—
2.	Is battery voltage present between control TB1 terminal 3 and B+ terminal when start switch S1 is pushed to "START?"	4	3
	⚠WARNING ***Batteries present the hazard of explosion, which can result in severe personal injury. Because batteries produce explosive gas, do not smoke or allow any arc-producing devices in the battery area.***		
3.	Replace start-stop switch S1.	—	—
4.	Is battery voltage present between start solenoid terminal S1 and ground when start switch S1 is pushed to "START?"	5	6
5.	Replace start solenoid K1 which is defective.	—	—
6	Perform generator tests. See *Generator* section.	—	—

B.	ENGINE CRANKS BUT DOES NOT START	YES	NO
1.	Is battery voltage present between stop relay K2 terminal 5 and a good ground when start switch is pushed to "START?" (Open control cover.)	3	2
	⚠WARNING ***Batteries present the hazard of explosion, which can result in severe personal injury. Because batteries produce explosive gas, do not smoke or allow any-arc producing devices in the battery area***		
2.	Check wiring to stop relay K2 and connections. Replace stop relay if necessary.	—	—
3.	Does unit have fuel solenoid?	4	6
4.	Does fuel solenoid operate when start switch is pressed to "START?"	6	5
5.	Check wires to fuel solenoid, check solenoid, and replace if necessary.	—	—
6.	Does generator set have an electric fuel pump?	7	9
7.	Remove fuel line from carburetor and momentarily jumper control positive terminal of ignition coil to battery positive post. Does fuel pulsate from fuel line?	9	8
	⚠WARNING ***Fuel presents the hazard of fire or explosion which can cause severe personal injury or death. Do not permit any flame, spark, pilot light, cigarette, or other ignition source near the fuel system. Use extreme care during this test. Run fuel into a suitable container and make sure area is well-ventilated to prevent accumulation of explosive gasoline fumes. Keep an ABC type fire extinguisher near.***		

B.	ENGINE CRANKS BUT DOES NOT START	YES	NO
8.	Check wire lead to fuel pump, check fuel pump, and replace if necessary.	—	—
9	See the *Ignition System* section in the ENGINE portion of the Master Service Manual (922-0501).	—	—
C.	**ENGINE STARTS BUT STOPS WHEN START SWITCH IS RELEADED**	**YES**	**NO**
1.	Connect DC voltmeter to start solenoid relay K1 terminal S1, and to a good ground. Crank the engine until it starts, release start switch and note voltmeter. Did voltmeter indicate a voltage after start switch was released?	3	2
	⚠WARNING ***Electrical shock can cause severe personal injury or death. Use extreme caution when working on electrical circuitry. Attach and remove meter leads only when generator set is not operating. Do not touch meter or meter leads during testing.***		
2.	Check wire connections from generator to start solenoid K1 terminal S1. If OK, perform generator test *Generator Troubleshooting and Procedures).*	—	—
3.	Check resistor R1 and resistor connections. Are they OK?	5	4
4.	Replace resistor or wire leads as necessary.	—	—
5.	Check reverse current diode CR1 for short or open, and diode connections. Replace if necessary.	—	—
D.	**GENERATOR SET IS RUNNING-THEN STOPS**	**YES**	**NO**
1.	Press start switch S1 to "START". Did engine start but stop when switch S1 is released?	1C	2
2.	Connect a DC voltmeter between stop relay K2 terminal 5 and a good ground. (Open control cover.) Is battery voltage present when start switch is pushed to "START?"	3B	3
3.	Jumper stop relay terminals 5 and 11. Crank the engine. Does engine start and run?	4	5
4.	Stop the engine. Jumper battery positive to stop relay K2 terminal 9. Does stop relay operate?	6	5
	⚠WARNING ***Batteries present the hazard of explosion, which can result in severe personal injury. Because batteries produce explosive gas, do not smoke or allow any arc-producing devices in the battery area.***		
5.	Replace stop relay K2.	—	—
6.	Check resistor R1 and resistor connections. Are they OK?	8	7
7.	Repair wire leads or replace resistor as necessary.	—	—
8.	Perform generator tests *(See Generator Troubleshooting and Procedures).*	—	—

E.	LOW BATTERY - NO HIGH CHARGE RATE	YES	NO
1.	Jumper two-step voltage regulator relay terminals "BAT" and "B". Start generator set. (Open control cover.) Does ammeter indicate higher charge rate? **WARNING** ***Batteries present the hazard of explosion, which can result in severe personal injury. Because batteries produce explosive gas, do not smoke or allow any arc-producing devices in the battery area.***	2	3
2.	Replace two-step voltage regulator relay K3.	—	—
3.	Check resistor R2, resistor connections, and replace if necessary.	—	—

MCCK (SPEC D) MODELS AND NH (SPEC A THROUGH C) MODELS

To correct a problem, answer the question in the appropriate troubleshooting chart either YES or NO. Refer to the number in that column and proceed to that step.

Use the wiring diagrams (see *Wiring Diagrams* section) to locate terminals, relays, etc. Figure 4-2 shows some of the control components for NH generator sets, Spec A through C.

⚠WARNING ***Many troubleshooting procedures present hazards which can result in severe personal injury or death. Only qualified service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Review safety precautions on inside cover page.***

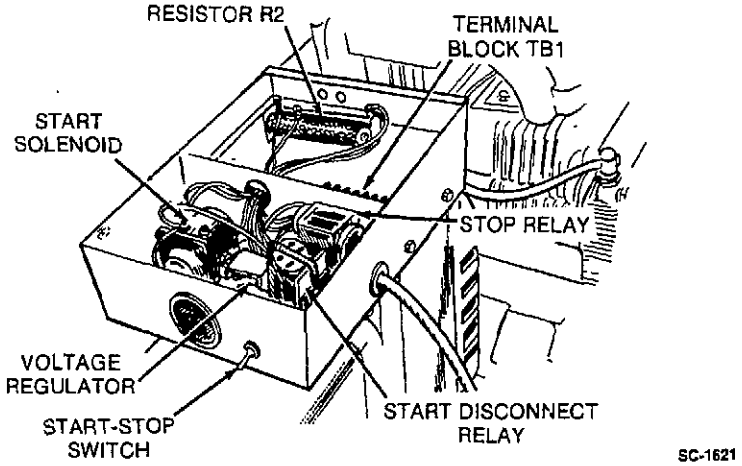


FIGURE 4-2. GENERATOR SET CONTROLS, MCCK (SPEC D), NH (SPEC A THROUGH C)

PROBLEM	SEE PAGE
A. Engine does not crank.	4-5
B. Engine cranks but does not start.	4-6
C. Engine starts but stops when start switch is released.	4-8
D. Engine is running - then stops.	4-8
E. Low battery - no charge rate.	4-8

A.	ENGINE DOES NOT CRANK	YES	NO
1.	Check battery. Are battery cables tight? **⚠WARNING** ***Batteries present the hazard of explosion, which can result in severe personal injury. Because batteries produce explosive gas, do not smoke or allow any arc-producing devices in the battery area.***	2	—
2.	Connect a DC voltmeter between control terminal 3 and B+ terminal. (Open control cover.) Is battery voltage present when start switch is pushed to "START?" **⚠WARNING** ***Electrical shock can cause severe personal injury or death. Use extreme caution when working on electrical circuitry. Attach and remove meter leads only when generator set is not operating. Do not touch meter or meter leads during testing.***	4	3
3.	Replace start-stop switch S1.	—	—

A.	ENGINE DOES NOT CRANK	YES	NO
4.	Connect the DC voltmeter between terminal 7 of the start disconnect relay assembly and battery B+ terminal. Is battery voltage present when start switch S1 is pushed to "START"?	6	5
5.	Replace start disconnect relay from start disconnect assembly.	—	—
6.	Connect the DC voltmeter to the start solenoid relay terminal S1 and to a good ground. Is battery voltage present when start switch is pushed to "START"?	8	7
7.	Replace start solenoid relay K1.	—	—
8.	Perform generator tests. See *Generator* section.	—	—
B.	**ENGINE CRANKS BUT DOES NOT START**	**YES**	**NO**
1.	Connect a DC voltmeter between the control B+ terminal and terminal 9 of the start disconnect relay assembly. (Open control cover.) Is battery voltage present when start switch S1 is pushed to "START"? **⚠WARNING** ***Electrical shock can cause severe personal injury or death. Use extreme caution when working on electrical circuitry. Attach and remove meter leads only when generator set is not operating. Do not touch meter or meter leads during testing.***	3	2
2.	Replace the start disconnect printed circuit board.	—	—
3.	Connect a DC voltmeter between control terminal 2 and 1. Is battery voltage present when the start switch is pushed to "START"?	7	4
4.	Check resistor R3 and resistor connections. Are they OK?	6	5
5.	Repair wire lead connections or replace resistor as required.	—	—
6.	Replace start disconnect relay K4.	—	—
7.	Is the unit an MCCK series generator set?	8	20
8.	Is the red button on the low oil pressure relay K5 out? (Wait at least one minute, then push in red button.)	9	11
9.	Check oil level. If okay, remove wire lead from low oil pressure switch S4 and push start switch. Does engine crank and run? **⚠WARNING** ***Operating the engine with inadequate oil and oil pressure can damage or destroy it. Make sure the engine has sufficient oil and oil pressure. Otherwise, engine damage will occur.***	10	11
10.	Check for a grounded wire lead to the low oil pressure switch S4. Check low oil pressure switch S4 and resistor R4. Replace as necessary.	—	—
11.	Connect the DC voltmeter to stop relay K2 terminal 5 and to a good ground. Is battery voltage present when start switch S1 is pushed to "START"?	13	12

B.	ENGINE CRANKS BUT DOES NOT START	YES	NO
12.	Check wiring to stop relay K2 and connections. Replace stop relay if necessary.	—	—
13.	Jumper resistor RT1 terminal with wire lead which goes to low oil pressure relay K5 and push start switch S1. Does engine crank and run?	14	15
	⚠WARNING ***Electrical shock can cause severe personal injury or death. Use extreme caution when working on electrical circuitry. Attach and remove jumper leads only when generator set is not operating. Do not touch jumper leads during testing.***		
14.	Check low oil pressure relay K5 and replace if necessary.	—	—
15.	Jumper high water temperature switch S3 and push start switch. Does engine crank and run?	16	17
16.	Check high water temperature switch S3 and wiring. Replace as necessary.	—	—
17.	Does generator set have a fuel solenoid K6?	18	20
18.	Does fuel solenoid K6 operate when you push start switch S1 to "START"?	20	19
19.	Check wire to fuel solenoid, check fuel pump, and replace if necessary.	—	—
20.	Connect a DC voltmeter to the "+" terminal of the ignition coil and to a good ground. Is battery voltage present when the start switch S1 is pushed to "START"?	22	21
21.	Check wiring to stop relay K2 and connections. Replace stop relay if necessary.	—	—
22.	Does unit have a low oil pressure switch?	23	27
23.	Check oil level. If okay, remove wire lead from low oil pressure switch and push start switch. Does engine crank and run?	24	27
	⚠CAUTION ***Operating the engine with inadequate oil and oil pressure can damage or destroy it. Make sure the engine has sufficient oil and oil pressure. Otherwise, engine damage will occur.***		
24.	Is wire lead from low pressure switch grounded?	25	26
25.	Repair or replace wire lead.	—	—
26.	Check low oil pressure switch and replace if necessary.	—	—
27.	Does unit have high air temperature switch?	28	32
28.	Remove wire lead from high air temperature switch and push start switch S1. (Do not let wire lead ground while disconnected). Does engine crank and run?	29	32
29.	Is wire lead from high air temperature switch grounded?	30	31
30.	Repair or replace wire lead.	—	—
31.	Check high air temperature switch and replace if necessary.	—	—
32.	Does generator set have an electric fuel pump?	33	35

B.	ENGINE CRANKS BUT DOES NOT START	YES	NO
33.	Remove fuel line from carburetor and jumper momentarily B+ to fuel pump. Does fuel pulsate from fuel line? **⚠WARNING** ***Fuel presents the hazard of fire or explosion which can cause severe personal injury or death. Do not permit any flame, spark, pilot light, cigarette, or other ignition source near the fuel system. Use extreme care during this test. Run fuel into a suitable container and make sure area is well-ventilated to prevent accumulation of explosive gasoline fumes. Keep an ABC type fire extinguisher nearby.***	35	34
34.	Check wire lead to fuel pump, check fuel pump and replace if necessary.	—	—
35.	See the *Ignition System* section in the ENGINE portion of the Master Service Manual (922-0501).	—	—
C.	**ENGINE STARTS - BUT STOPS WHEN START SWITCH IS RELEASED**	**YES**	**NO**
1.	Check resistor R2 and resistor connections in control (open cover). Are they OK?	3	2
2.	Replace resistor or wire leads as necessary.	—	—
3.	Check wire connections from generator to start solenoid K1 terminal S1. If OK, perform generator tests (see *Generator Troubleshooting and Procedures).*	—	—
D.	**ENGINE IS RUNNING - THEN STOPS**	**YES**	**NO**
1.	Check the unit for a high air temperature, high water temperature, or low oil pressure condition (if applicable) which would shut down the engine. If no safety shutdown occurred, connect a DC voltmeter to the "IGN" terminal of control terminal block TB1 (control cover open). Crank the engine. Does engine start? **⚠WARNING** ***Electrical shock can cause severe personal injury or death. Use extreme caution when working on electrical circuitry. Attach and remove meter leads only when generator set is not operating. Do not touch meter or meter leads during testing.***	2	1B
2.	Did engine keep running after start switch was released?	3	1C
3.	Recheck for high air temperature, low oil condition, etc., which may have occurred.	—	
E.	**LOW BATTERY - NO HIGH CHARGE RATE**	**YES**	**NO**
1.	Jumper two-step voltage regulator relay terminals "BAT" and "B." (Open control cover.) Start generator set. Does ammeter indicate higher charge rate? **⚠WARNING** ***Batteries present the hazard of explosion, which can result in severe personal injury. Because batteries produce explosive gas, do not smoke or allow any arc-producing devices in the battery area.***	2	3
2.	Replace two-step voltage regulator relay K3.		
3.	Check resistor R1 and resistor connection and replace if necessary.	—	—

CCK (SPEC R) MCCK (BEGIN SPEC E), AND NH (SPEC D THROUGH F) MODELS

To correct a problem, answer the question in the appropriate troubleshooting either YES or NO. Refer to the number in that column and proceed to that step.

Use the wiring diagram (see *Wiring Diagrams* section) to locate terminals, relays, etc. Figure 4-3 shows some of the control components for NH generator sets, Spec D through F; CCK generator sets, Spec R; and MCCK generator sets, begin Spec E (except automatic-starting MCCK units, described under CONTROL-O-MATIC in Part III, Section 5 of the Onan Master Service Manual).

⚠WARNING ***Many troubleshooting procedures present hazards which can result in severe personal injury, death, and/or equipment damage. Only qualified service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Review safety precautions on inside cover page.***

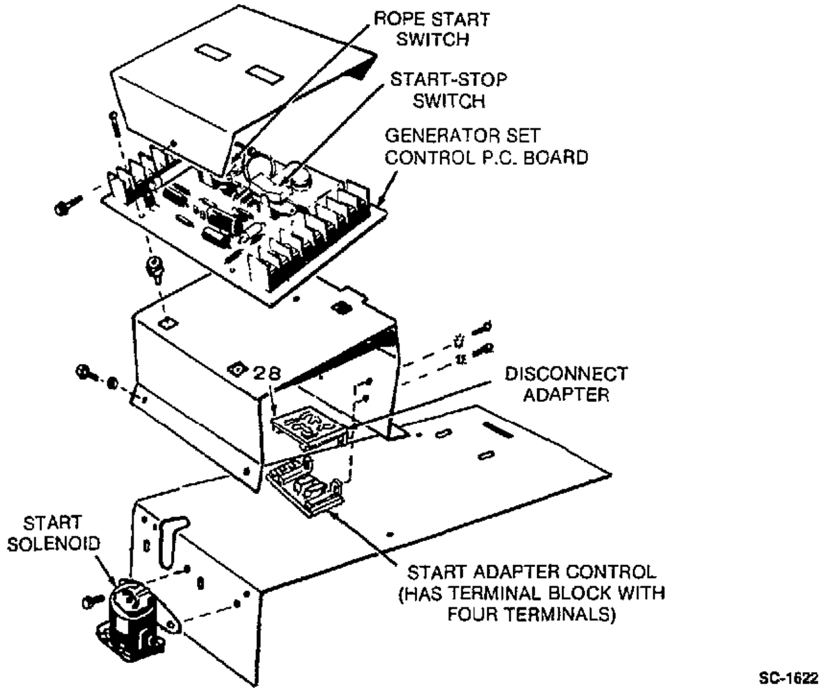


FIGURE 4-3. GENERATOR SET CONTROLS, CCK (SPEC R), MCCK (BEGIN SPEC E), NH (SPEC D THROUGH F)

PROBLEM	SEE PAGE
A. Engine does not crank.	4-10
B. Engine cranks but does not start.	4-11
C. Engine starts but stops when start switch is released.	4-12
D. Engine is running - then stops.	4-13
E. Low battery - no high charge rate.	4-13
F. Battery loses excess water.	4-13

A.	ENGINE DOES NOT CRANK	YES	NO
	For generator sets with a three-wire start adapter printed circuit (P.C.) board (below the control P.C. board) and a remote start-stop station, perform start tests first from the generator set control. If the generator set starts using the generator set control, the problem lies in the three-wire adapter board or the remote switch. Check relay K2 of the adapter by jumping terminal 3 to ground. If the relay does not operate or its contacts do not close to energize the start circuit, replace the board.		
1.	Check battery. Are battery cables tight?	2	—
	⚠WARNING ***Batteries present the hazard of explosion, which can result in severe personal injury. Because batteries produce explosive gas, do not smoke or allow any arc-producing devices in the battery area.***		
2.	Does generator set have a start disconnect adapter P.C. board below the generator set control assembly P.C. board (don't confuse this board with a three-wire adapter, P.C. board on some models which has a terminal block).	3	5
	⚠WARNING ***For marine applications, be sure bilge blower has operated and time delay (if applicable) on start has completed. Otherwise, there is potential danger of explosion or fire from fuel vapors.***		
3.	Jumper between control terminal 16 and start solenoid terminal K1-S. Press start switch A1S1. Does engine crank?	4	5
4.	Replace start disconnect adapter P.C. board.	—	—
5.	Push "Hand Crank" ELECTRIC (called "ROPE START" or "NONFUNCTIONAL" on some models) switch A1S1. Is battery voltage present between control terminal 6 and ground?	9	6
6.	Remove control cover and jumper terminal 5 to terminal 6. Is battery voltage present between terminal 6 and ground?	7	8
	⚠WARNING ***Electrical shock can cause severe personal injury or death. Use extreme caution when working on electrical circuitry. Attach and remove meter leads only when generator set is not operating. Do not touch meter or meter leads during testing.***		
7.	Replace switch A1S1.	—	—
8.	Check battery cables for correct polarity. Replace fuse F1 with a 9-ampere, in-line fuse. Push start switch A1S2.	-	9
9.	With start switch A1S2 depressed, is at least 8 volts present from terminal 9 to ground?	10	14
10.	Jumper solenoid coil terminal S to battery. Does start solenoid K1 operate?	11	12

A.	ENGINE DOES NOT CRANK	YES	NO
11.	Is battery voltage present from right-hand terminal of start solenoid to ground when start solenoid is energized?	13	12
12.	Start solenoid is defective and must be replaced.	—	—
13.	Perform generator tests. See *Generator* section.	—	—
14.	Is voltage present from terminal 15, 17, or 18 to ground?	17	15
15.	With start switch A1S2 depressed, jumper terminal 5 to terminal 15, 17 or 18. Does engine crank and start?	16	17
16.	Remove control P.C. board. Replace A1F2 fuse path with a one-inch (25 mm) length of number 22 wire. Solder in place through holes provided.	—	—
17.	Jumper control terminal 5 to 16. Does engine crank?	18	19
18.	Replace start switch A1S2.	—	—
19.	With start switch A1S2 depressed, jumper control terminals 9 to 16. Does engine crank?	20	—
20.	Check transistor A1Q2. If defective, replace control P.C. board.	—	—

B.	ENGINE CRANKS BUT DOES NOT START	YES	NO
1.	Is battery voltage present between control terminal 6 and ground when start switch A1S2 is depressed?	4	2
	⚠WARNING ***Electrical shock can cause severe personal injury or death. Use extreme caution when working on electrical circuitry. Attach and remove meter leads only when generator set is not operating. Do not touch meter or meter leads during testing.***		
2.	Is battery voltage present between control terminal 6 and ground when switch A1S1 is depressed?	3	—
3.	Faulty switch A1S1 or diode A1CR1. Replace control P.C. board.	—	—
4.	Is operation with gasoline?	9	5
5.	Does gaseous fuel solenoid operate when switch A1S1 is pressed?	15	6
6.	Jumper terminal "VALVE" of gaseous vacuum switch (on intake manifold) to control terminal 6. Does fuel solenoid operate when switch A1S1 is pressed?	7	8
7.	Check wire leads to vacuum switch, check switch and replace if necessary.	—	—
8.	Check wire leads to gaseous fuel solenoid, check solenoid and replace if necessary.	—	—
9.	Does generator set have an electric fuel pump?	10	15
10.	Does generator set have a gasoline shutoff solenoid?	11	13
11.	Fuel solenoid must open during cranking and running. Remove the fuel line from carburetor and push switch A1S1. Does fuel pulsate from fuel line?	15	12

B.	ENGINE CRANKS BUT DOES NOT START	YES	NO
	⚠WARNING ***Fuel presents the hazard of fire or explosion which can cause severe personal injury or death. Do not permit any flame, spark, pilot light, cigarette, or other ignition source near the fuel system. Use extreme care during this test. Run fuel into a suitable container and make sure area is well-ventilated to prevent accumulation of explosive gasoline fumes. Keep an ABC type fire extinguisher nearby.***		
12.	Remove the fuel solenoid from the fuel line. Push switch A1S1. Does fuel pulsate from the line?	14	13
13.	Check wire lead to fuel pump, check fuel pump and replace if necessary.	—	—
14.	Check wire leads to gasoline solenoid, check solenoid and replace if necessary.	—	—
15.	Check oil level. If okay, remove wire lead for low oil pressure switch S1 from control terminal 4 and push start switch A1S2. Does engine crank and run?	16	19
	⚠CAUTION ***Operating the engine with inadequate oil and oil pressure can damage or destroy it. Make sure the engine has sufficient oil and oil pressure. Otherwise, engine damage will occur.***		
16.	Is wire lead from low oil pressure switch grounded?	17	18
17.	Repair or replace wire lead.	—	—
18	Check low oil pressure switch S1 and replace if necessary.	—	—
19.	Is unit water-cooled and does it have a high water temperature switch?	20	22
20.	Jumper across high water temperature switch and push start switch A1S2. Does engine crank and run?	21	27
21.	Check high water temperature switch and replace if necessary.	—	—
22.	Is unit air cooled and have a high air temperature switch?	23	27
23.	Remove wire lead from high air temperature switch from control terminal 3 and push start switch A1S2. Does engine crank and run?	24	27
24.	Is wire lead from high air temperature switch grounded?	25	26
25.	Repair or replace wire lead.	—	—
26.	Check high air temperature switch and replace if necessary.	—	—
27.	See the *Ignition System* section.	—	—

C.	ENGINE STARTS BUT STOPS WHEN START SWITCH IS RELEASED	YES	NO
1.	Connect voltmeter from control terminal 8 to ground. Crank engine. Is there DC voltage output from generator?	3	2
	⚠WARNING ***Electrical shock can cause severe personal injury or death. Use extreme caution when working on electrical circuitry. Attach and remove meter leads only when generator set is not operating. Do not touch meter or meter leads during testing.***		

C.	ENGINE STARTS BUT STOPS WHEN START SWITCH IS RELEASED	YES	NO
2.	Check resistor G1R11 and all resistor connections.	—	—
3.	Is voltage present from terminal 6 to ground after engine starts and start switch A1S2 is released?	—	4
4.	Replace control P.C. board.	—	—

D.	ENGINE IS RUNNING - THEN STOPS	YES	NO
1.	Check the unit for a high air temperature, high water temperature or low oil condition (if applicable) which would shut down unit. If no safety shutdown occurred, connect a DC voltmeter from control terminal 8 to ground. Crank the engine. Is there generator DC output voltage?	1B	2
2.	Check resistor G1R11 and all resistor connections. If OK, perform generator tests *(Generator Troubleshooting and Procedures).*	—	—

E.	LOW BATTERY - NO HIGH CHARGE RATE	YES	NO
1.	Remove wire lead from fuse F1 to control terminal 5. Connect DC ammeter between wire lead and terminal 5. Start generator set. Is high battery charge rate present (over 3 amperes)?	2	3
2.	Measure battery terminal voltage with voltmeter (one percent accuracy or better). Does voltage rise to 14 volts or more? **⚠WARNING** ***Batteries present the hazard of explosion, which can result in severe personal injury. Because batteries produce explosive gas, do not smoke or allow any arc-producing devices in the battery area.*** **⚠WARNING** ***Electrical shock can cause severe personal injury or death. Use extreme caution when working on electrical circuitry. Attach and remove meter leads only when generator set is not operating. Do not touch meter or meter leads during testing.***	4	3
3.	Remove control cover and jumper control terminals 7 and 8. Does charge rate increase?	6	5
4.	Check battery and replace if necessary.	—	—
5.	Stop generator set. Check wire leads to charge resistor G1R1. Check resistor and replace if necessary.	—	—
6.	Replace control P.C. board.	—	—

F.	BATTERY LOSES EXCESS WATER	YES	NO
1.	Connect a voltmeter (one percent accuracy or better) to battery terminals, start and run generator set for 30 minutes. Does battery terminal voltage exceed: a. 14 volts at 100°F (38°C) or above; or b. 15 volts at 50 to 100°F (10 to 38°C); or c. 16 volts at 50°F (10°C) or below? **⚠WARNING** ***Electrical shock can cause severe personal injury or death. Use extreme caution when working on electrical circuitry. Attach and remove meter leads only when generator set is not operating. Do not touch meter or meter leads during testing.***	2	—
2.	Replace control P.C. board.	—	—

GENERAL CONTROL P.C. BOARD PROBLEMS AND SYMPTOMS

SYMPTOM: Engine won't start and electric fuel pump won't work unless hand crank switch A1S1 is pushed during cranking. Engine runs okay after starting with hand crank switch.

PROBLEM: Diode A1CR1 is destroyed through accidental grounding of terminal 6 or the leads supplying current to the ignition coil, electric fuel pump or fuel solenoid when start switch closes.

SOLUTION: To prevent future failure of diode A1CR1 on units without 9-ampere fuse on terminal 5, add in-line fuse package #321-0212. Refer to Product Support Bulletin #57.

SYMPTOM: Engine stops running as soon as start switch is released.

PROBLEM: Diode A1CR2 is destroyed through accidental grounding of terminal 6 or the leads supplying current to the ignition coil, electric fuel pump or fuel solenoid, while engine is running.

SOLUTION: To prevent future failure of diode A1CR2 on units without 9-ampere fuse on terminal 5, add inline fuse package #321-0212. Refer to Product Support Bulletin #57. The fuse does not protect A1CR2, but will blow during cranking if terminal 6 is grounded.

SYMPTOM: Start solenoid will not energize (check for faulty solenoid before checking following).

1. PROBLEM: Diode A1CR4 may be burned out if battery connections are accidentally reversed on units not protected by 9-ampere fuse F1 on terminal 5.

   SOLUTION: To prevent future failure of diode A1CR4 on units without 9-ampere fuse on terminal 5, add inline fuse package #321-0212. Refer to Product Support Bulletin #57.

2. PROBLEM: Accidental reverse battery connection to units not protected by in-line fuse package #321-0212 may damage diode A1CR5.

   SOLUTION: To prevent future failure of diode A1CR5 on units without 9-ampere fuse on terminal 5, add in-line fuse package #321-0212. Refer to Product Support Bulletin #57.

Controls Without Start Disconnect Adapter

SYMPTOM: Start solenoid won't energize.

PROBLEM: On units without 9-ampere fuse on terminal 5, accidental grounding of terminal 9 or reverse battery connections may damage transistor A1Q2.

SOLUTION: To prevent future failure of transistor A1Q2, on units without 9-ampere in-line fuse on terminal 5, install in-line fuse package #321-0212. Refer to Product Support Bulletin #57.

SYMPTOM: Engine cranks but will not start (no battery voltage at terminal 6).

PROBLEM: A short circuit or accidental ground on terminal 6 may burn the copper path from terminal 6 to A1S1 when start switch is pushed and/or burn the copper path from terminal 5 to A1S1 if handcrank switch is pushed.

SOLUTION: To prevent future burning of copper path, on units not having 9-ampere fuse on terminal 5, add in-line fuse package #321-0212. Refer to Product Support Bulletin #57.

SYMPTOMS:
1. Engine won't crank. F1 or A1F2 open.
2. Remote running time meter or generating lamp won't work. A1F3 fuse open.

PROBLEM: On units not having a 9-ampere fuse protection on terminal 5, customer wiring errors including reverse battery connections, causes A1F2 and A1F3 to blow.

SOLUTION: F1-On units not having a 9-ampere in-line, F1 fuse protection, solder a wire in place of A1F1 fuse link on printed circuit board (wire size not important). Add in-line fuse package #321-0212. Refer to Product Support Bulletin #57.

GENERAL CONTROL P.C. BOARD PROBLEMS AND SYMPTOMS (Continued)

A1F2-On units not having a 9-ampere fuse protection on terminal 5, install insulated jumper wire from TB2-18 to TB1-5. Add in-line fuse package #321-0212. Refer to Product Support Bulletin #57.

A1F3-Connect bypass fuse assembly #321-0210 between TB1-2 and TB2-10. Refer to Product Support Bulletin #40.

SYMPTOM: Engine won't stop on low oil pressure or may not stop with stop watch.

PROBLEM: Customer wiring errors which place battery voltage on terminal 14 destroys diode A1CR8 and/or copper path from terminal 4 through switch A1S2 and A1CR8 (may also destroy copper path from terminal 1 to 14).

SOLUTION: Correct the problem (wiring, etc.). To prevent future failure of diode A1CR8 or burnt copper paths, install in-line fuse package #321-0212. Older units having fuse link A1F1 on the printed circuit board may also have blown. Replace A1F1 fuse link with jumper wire.

SYMPTOM: Engine won't stop with stop switch pushed or from low oil pressure.

PROBLEM: On units without 9-ampere fuse on terminal 5, accidental connection of battery positive voltage from terminal 15 or 16 to terminal 14, burns one of the following copper paths.

Path from terminal 1 to 14.
Path from terminal 4 to switch A1S1.
Path from terminal 12 to switch A1S1.
Path from terminal 14 to diode A1CR8.

SOLUTION: To prevent future burning out of copper paths, on units without 9-ampere fuse on terminal 5, add the in-line fuse package #321-0212. Refer to Product Support Bulletin #57.

SYMPTOMS: Excessive current overheats and destroys diode A1CR10 and copper path from A1CR10 to terminal 2.

PROBLEM: There are three known causes of excessive currents which may cause this problem.

1. Reverse battery connections on units not having the 9-ampere in-line fuse F1 and diode A1CR11 protection.
2. Improper transfer switch that may connect AC utility power to the generator output while transferring from utility to generator power. See Product Support Bulletin #58.
3. Starting solenoid chatter or sticking solenoid at high cranking current causes current surges beyond the thermal capability of diode A1CR10.

SOLUTION: To prevent future failure of diode A1CR10 on units without a 9-ampere fuse on terminal 5 for symptoms 1 and 2 above, add in-line fuse package #321-0212. Refer to Product Support Bulletins #57 and #58.

To prevent future failure of diode A1CR10 due to start solenoid chatter or sticking for symptom 3 on units without a start disconnect adapter, add a start disconnect package #300-1231.

PROBLEM: A1S1 push button and A1S1 spring can snap off if care is not used in removing cover.

SOLUTION: Install cover and switch repair package (part #300-1232) which contains all necessary hardware and parts to repair a missing switch push button or spring. This means it is not necessary to replace the complete printed circuit board unless the entire switch itself becomes broken. In order to prevent either problem, exercise greater care when removing the printed circuit board cover. Refer to Product Support Bulletin #57.

Corroded or burned printed circuit parts can and should be repaired by soldering a piece of #20 gauge or larger insulated wire between soldered connections on the printed circuit board. Soldering on the printed circuit paths themselves on the bottom of the board is difficult and should be avoided.

In some cases a jumper wire can be connected between terminals on the terminal strips.

BF, CCK (BEGIN SPEC U), LK (BEGIN SPEC M), AND NH (BEGIN SPEC J) MODELS

To correct a problem, answer the question in the appropriate troubleshooting chart either YES or NO. Refer to the number in that column and proceed to that step.

Use the wiring diagrams (see *Wiring Diagrams* section) to locate terminals, relays, etc. Figure 4-4 shows some of the control components for these generator sets.

⚠WARNING ***Many troubleshooting procedures present hazards which can result in severe personal injury, death, and/or equipment damage. Only qualified service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Review safety precautions on inside cover page.***

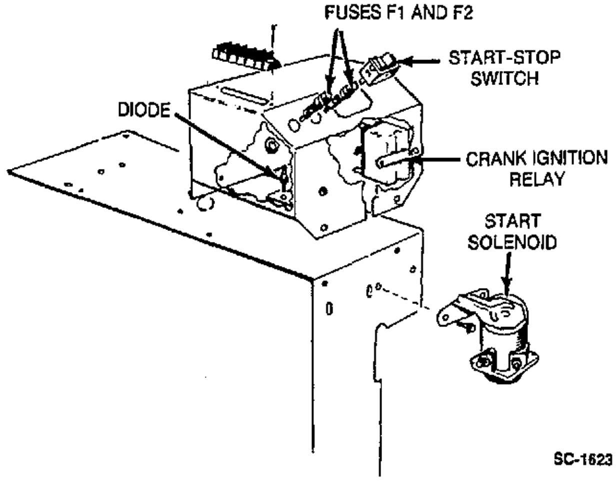


FIGURE 4-4. GENERATOR SET CONTROLS, BF, CCK (BEGIN SPEC U), LK (BEGIN SPEC M), NH (BEGIN SPEC J)

PROBLEM	SEE PAGE
A. Engine does not crank.	4-16
B. Engine cranks but does not start.	4-17
C. Engine starts but stops when start switch is released.	4-18
D. Engine is running - then stops.	4-18
E. Low battery - no charge rate.	4-18
F. Running time meter inoperative.	4-18
G. Battery condition meter inoperative.	4-19

A.	ENGINE DOES NOT CRANK	YES	NO
1.	Check battery. Are battery cables tight? **⚠WARNING** ***Batteries present the hazard of explosion, which can result in severe personal injury. Because batteries produce explosive gas, do not smoke or allow any arc-producing devices in the battery area.***	2	—
2.	Is battery voltage present between control terminal 3 and 5 when switch S1 is pushed to "START?" **⚠WARNING** ***Electrical shock can cause severe personal injury or death. Use extreme caution when working on electrical circuitry. Attach and remove meter leads only when generator set is not operating. Do not touch meter or meter leads during testing.***	4	3

A.	ENGINE DOES NOT CRANK	YES	NO
3.	Replace start-stop switch S1.	—	—
4.	Is battery voltage present between start solenoid K1 terminal S1 and ground when start switch is pushed to "START?"	6	5
5.	Replace start solenoid.	—	—
6.	Perform generator tests. See *Generator* section.	—	—
B.	**ENGINE CRANKS BUT DOES NOT START**	**YES**	**NO**
1.	Is battery voltage present at control terminal 6 and ground when start switch S1 is pushed to "START?"	5	2
2.	Is fuse F2 in circuit to control terminal 6 "blown?"	3	4
3.	Replace fuse.	—	—
4.	Make sure Faston terminals are making good connections. If OK, replace defective start solenoid on 4.0 BF (Spec A) or crank ignition relay K2 on 2.5 LK (Spec M), 4.0 BF (Spec B), CCK (Spec U), and NH (Spec J).	—	—
5.	Fuel solenoid must open during cranking and running. Remove the fuel line from carburetor and momentarily jumper control terminal 5 to 6. Does fuel pulsate from fuel line?	7	6
	⚠WARNING ***Fuel presents the hazard of fire or explosion which can cause severe personal injury or death. Do not permit any flame, spark, pilot light, cigarette, or other ignition source near the fuel system. Use extreme care during this test. Run fuel into a suitable container and make sure area is well-ventilated to prevent accumulation of explosive gasoline fumes. Keep an ABC type fire extinguisher nearby.***		
6.	Check wire lead to fuel pump. Check fuel pump and replace if necessary.	—	—
7.	Does engine have oil pump and full pressure lubrication?	8	12
8.	Check oil level. If okay, remove wire lead from low oil pressure switch and push start swtich. Does engine crank and run?	9	12
	⚠CAUTION ***Operating the engine with inadequate oil and oil pressure can damage or destroy it. Make sure the engine has sufficient oil and oil pressure. Otherwise, engine damage will occur.***		
9.	Is wire lead from low oil pressure switch grounded?	10	11
10.	Repair or replace wire lead.	—	—
11.	Check low oil pressure switch and replace if necessary.	—	—
12.	Does unit have a high air temperature switch?	13	17

B.	ENGINE CRANKS BUT DOES NOT START	YES	NO
13.	Remove wire lead from high air temperature switch and push start switch S1 (do not let wire lead ground while disconnected). Does engine crank and run?	14	17
14.	Is wire lead from high air temperature switch grounded.?	15	16
15.	Repair or replace wire lead.	—	—
16.	Check high air temperature switch and replace if necessary	—	—
17.	See the *Ignition System* section.	—	—
C.	**ENGINE STARTS BUT STOPS WHEN START SWITCH IS RELEASED**	**YES**	**NO**
1.	Connect DC voltmeter from control terminal 6 to ground. Crank engine. Is there DC voltage output from generator (fuse F2 should be OK if unit started initially)?	—	2
	⚠WARNING ***Electrical shock can cause severe personal injury or death. Use extreme caution when working on electrical circuitry. Attach and remove meter leads only when generator set is not operating. Do not touch meter or meter leads during testing.***		
2.	Check resistor R1 and resistor connections. If OK, perform generator tests (see *Generator Troubleshooting and Procedures*).	—	—
D.	**ENGINE IS RUNNING - THEN STOPS**	**YES**	**NO**
1.	Check the unit for a high air temperature, or high water temperature (whichever applies) or low oil pressure condition which would shut down the engine. If no safety shutdown has occurred, connect a DC voltmeter from control terminal 6 to ground. Crank the engine. Is there DC generator output voltage?	1B	2
2.	Is fuse F2 in circuit to control terminal 6 "blown?"	3	4
3.	Replace fuse.		
4.	Check resistor R1 and all resistor connections. If OK, perform generator tests. See *Generator Troubleshooting and Procedures.*	—	—
E.	**LOW BATTERY - NO CHARGE RATE**	**YES**	**NO**
1.	Is reverse current diode CR1 shorted or open?	2	3
2.	Replace diode.	—	—
3.	Check wiring from diode CR1 to start solenoid and to battery.	—	—
F.	**RUNNING TIME METER INOPERATIVE**	**YES**	**NO**
1.	Check wires between control terminal 6 and battery positive terminal for running time meter, and ground wire and connection to meter. Does this correct the problem?	—	2
2.	Replace defective running time meter.	—	—

G.	BATTERY CONDITION METER INOPERATIVE	YES	NO
1.	Is fuse F1 "blown?"	2	3
2.	Replace fuse with equivalent type fuse.	—	—
3.	Check wires between control terminal 5 and battery positive terminal for battery condition meter terminal and ground wire and connection to meter. Does this correct problem?	—	4
4.	Replace defective battery condition meter.	—	—

BFA, BGA, AND NH (SPEC K) MODELS

To correct a problem, answer the question in the appropriate troubleshooting chart either YES or NO. Refer to the number in this column and proceed to that step.

Use the wiring diagrams (see *Wiring Diagrams* section) for location of terminals, relays etc. Figure 4-5 shows some of the control components for the generator sets.

⚠WARNING ***Many troubleshooting procedures present hazards which can result in severe equipment damage. Only qualified service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Review safety precautions on inside cover page.***

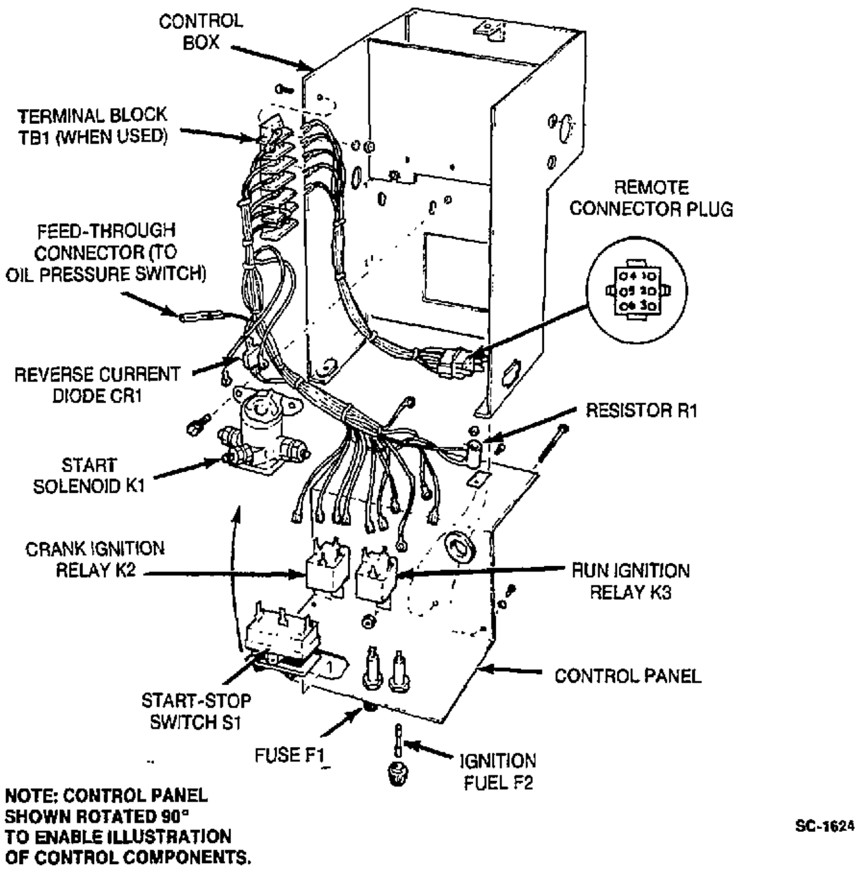


FIGURE 4-5. GENERATOR SET CONTROLS, BFA, BGA, NH (SPEC K)

PROBLEM	SEE PAGE
A. Engine does not crank.	4-21
B. Engine cranks but does not start.	4-21
C. Engine starts but stops when start switch is released.	4-22
D. Engine is running - then stops.	4-22
E. Low battery - no charge rate.	4-22
F. Running time meter inoperative.	4-23
G. Battery condition meter inoperative.	4-23

A.	ENGINE DOES NOT CRANK	YES	NO
1.	Check battery. Are battery cables tight?	2	—
	⚠WARNING ***Batteries present the hazard of explosion, which can result in severe personal injury. Because batteries produce explosive gas, do not smoke or allow any arc-producing devices in the battery area.***		
2.	Is battery voltage present between control remote connector plug terminals 3 and 5 (or between TB1-3 and TB1-5 where applicable) when start-stop switch S1 is pushed to "START?" (See drawing of connector plug in Figure D.)	4	3
	⚠WARNING ***Electrical shock can cause severe personal injury or death. Use extreme caution when working on electrical circuitry. Attach and remove meter leads only when generator set is not operating. Do not touch meter or meter leads during testing.***		
3.	Replace start-stop switch S1.	—	—
4.	Is battery voltage present between start solenoid K1 terminal S1 and ground when start switch is pushed to "ON?"	6	5
5.	Replace start solenoid.	—	—
6.	Perform generator tests. See *Generator* section.	—	—
B.	**ENGINE CRANKS BUT DOES NOT START**	**YES**	**NO**
1.	Is 5-ampere fuse F2 blown?	2	3
2.	Replace fuse.	—	—
3.	Is battery voltage present between control remote connector plug terminal 6 (or terminal TB1-6 where applicable) and ground when start-stop switch S1 is pushed to "START?" (Figure D shows locations of connector plug terminals.)	5	4
4.	Make sure Faston terminals are making good connections to crank ignition relay K2. If OK, replace crank ignition relay.	—	—
5.	Disconnect B+ wire from ignition coil. Remove the fuel line from the carburetor, connect a flexible hose long enough to run fuel in a suitable container. Momentarily push start-stop switch to "START." Does fuel pulsate into container? (Reconnect line and wire to ignition coil after test.)	7	6
	⚠WARNING ***Fuel presents the hazard of fire or explosion which can cause severe personal injury or death. Do not permit any flame, spark, pilot light, cigarette, or other ignition source near the fuel system. Use extreme care during this test. Run fuel into a suitable container and make sure area is well-ventilated to prevent accumulation of explosive gasoline fumes. Keep an ABC type fire extinguisher nearby.***		

B.	ENGINE CRANKS BUT DOES NOT START	YES	NO
6.	Check lead to fuel pump. Check fuel element to see if it needs cleaning. Replace fuel pump if necessary.	—	—
7.	See the *Ignition System* section.	—	—
C.	**ENGINE STARTS BUT STOPS WHEN START SWITCH IS RELEASED**	**YES**	**NO**
1.	Is engine oil level OK?	3	2
2.	Add oil as needed.	—	—
3.	Remove cover from control assembly. Are resistor R1 (120-ohm) and resistor connections OK (located near bottom of control).?	5	4
4.	Remedy or replace as needed.	—	—
5.	If oil level was OK in Step 1, pull apart feed-through connector (shown in Figure 4-5) in control from run ignition relay K3 and connect lead from K3 to a good ground. Push start switch. Does engine crank and run? **⚠CAUTION** ***Operating the engine with inadequate oil and oil pressure can damage or destroy it. Make sure the engine has sufficient oil and oil pressure. Otherwise, engine damage will occur.***	6	7
6.	Stop engine and reconnect feed-through connector. Check low oil pressure switch, check lead to low oil pressure switch and repair or replace as needed.	—	—
7.	Reconnect feed-through connector in control, jumper remote connector plug terminals 5 and 6 (or terminals TB1-5 and TB1-6 if applicable), and push start switch S1 to "START" (fuse F1 must be OK for this test). Does engine crank and run? (Figure 4-5 shows locations of connector plug terminals.)	8	—
8.	With engine running, is there 12 VDC from remote connector plug terminal 2 (or terminal block terminal TB1-2) to ground?	9	10
9.	Replace run ignition relay K3.	—	—
10.	See *Generator Troubleshooting and Procedures.*	—	—
D.	**GENERATOR SET IS RUNNING—THEN STOPS**	**YES**	**NO**
1.	Is there fuel in the fuel tank?	2	—
2.	Does engine have a low oil level (pressure) condition?	3	4
3.	Refill oil to proper oil level.	—	—
4.	See "ENGINE STARTS BUT STOPS WHEN START SWITCH IS RELEASED" in *Troubleshooting.*	—	—
E.	**LOW BATTERY—NO CHARGE RATE**	**YES**	**NO**
1	Is reverse current diode CR1 shorted or open?	2	3
2.	Replace diode.	—	—
3.	Is wiring from reverse current diode to battery OK?	5	4
4.	Remedy as necessary.	—	—

E.	LOW BATTERY—NO CHARGE RATE	YES	NO
7.	Remove wrapper from around the generator. Is resistor R2 and are resistor connections OK?	7	6
6.	Remedy or replace as necessary.	—	—
7.	See *Generator Troubleshooting and Procedures.*	—	—
F.	**RUNNING TIME METER INOPERATIVE**	**YES**	**NO**
1.	Check wires between control remote connector plug terminal 6 (or TB1-6 where applicable) and battery positive terminal for running time meter, and ground wire and connection to meter. Does this correct problem? (Figure 4-5 shows locations of connector plug terminals.)	—	2
2.	Replace defective running time meter.	—	—
G.	**BATTERY CONDITION METER INOPERATIVE**	**YES**	**NO**
1.	Is fuse F1 "blown?"	2	3
2.	Replace fuse with equivalent type fuse.	—	—
3.	Check wires between control remote connector plug terminal 5 (or TB1-5 where applicable) and battery positive terminal for battery condition meter terminal and ground wire and connection to meter. Does this correct problem? (Figure 4-5 shows locations of connector plug terminals.)	—	4
4.	Replace defective battery condition meter.	—	—

Section 5. Power Drawer Models

GENERATOR DISASSEMBLY

The generator used in the Power Drawer genset normally needs little care, other than a periodic check of the brushes and collector rings. If a major repair is necessary, have the genset checked and tested by an Onan service technician or a qualified electrician.

⚠WARNING ***Many troubleshooting procedures present hazards which can result in severe personal injury, death, and/or equipment damage. Only qualified service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Review safety precautions on inside cover page.***

1. Remove the unit from its slide rails.
2. Remove all accessories attached to the generator.
3. Tag and remove all leads.
4. Loosen and lift out both brush rigs (Figure 5-1).

   ⚠CAUTION ***The brushes will be damaged during disassembly if not held off the slip rings. Use extreme care when removing the brush rigs.***

5. Remove four generator through-stud nuts.
6. Lift or pull the end bell from the frame assembly. Do not pry it loose with a screwdriver; rather, tap around the edges of the end bell with a plastic hammer to loosen it.

   ⚠CAUTION ***Striking the end bell or other generator parts can damage or destroy them. Use extreme care while tapping the edges of the end bell to loosen it.***

7. Remove the frame (field) assembly, being careful not to let it rest or drag on the armature.

   ⚠CAUTION ***The generator will overheat if it is reassembled incorrectly. Four seals are used between the frame (field) assembly and engine-to-generator adapter. These seals must be used to reassemble the generator correctly.***

8. Insert a square 3/8 inch drive into the 12-point (internal wrenching) armature holddown nut to remove it.
9. While pulling outward with one hand under the armature, strike a sharp blow on the end of the armature shaft to loosen the armature. The armature has an internal taper which fits onto the external taper of the engine adapter. If the armature does not come loose, place a heavy brass rod on the armature shaft near the ball bearing and strike a sharp downward blow on the rod with a hammer. Rotate the armature 1/2 turn before repeating.

   ⚠CAUTION ***Striking the collector rings or bearing can severely damage or destroy them. Use extreme care when performing the procedure described above.***

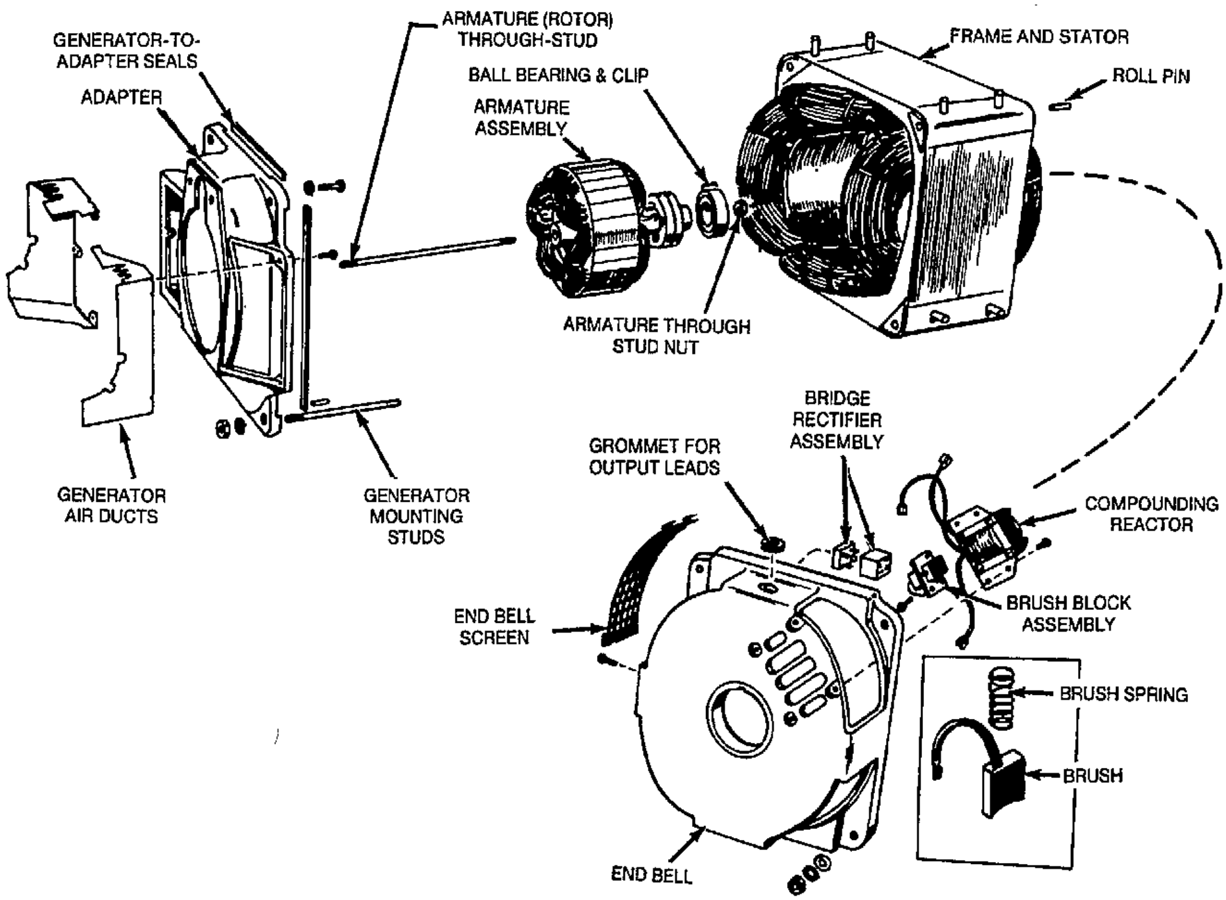


FIGURE 5-1. EXPLODED VIEW OF AC GENERATOR

GENERATOR TROUBLESHOOTING GUIDE

⚠WARNING ***Many troubleshooting procedures present hazards which can result in severe personal injury or death. Only qualified service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Review safety precautions on inside cover page.***

⚠WARNING ***Fuel presents the hazard of fire or explosion which can cause severe personal injury or death. Do not permit any flame, spark, pilot light, cigarette, or other ignition source near the fuel system. Keep an ABC type fire extinguisher nearby.***

⚠WARNING ***Arcing or inadvertent starting of the generator set can cause damage to the generator set, severe personal injury, or death. For this reason, disconnect the negative (-) battery cable before beginning these procedures, and do not reconnect the negative (-) battery cable until these procedures are complete.***

⚠WARNING ***Electrical shock can cause severe personal injury or death. Use extreme caution when working on electrical circuitry. Attach and remove meter leads only when generator set is not operating. Do not touch meter or meter leads during testing.***

⚠CAUTION ***The brushes are easily damaged during genset disassembly/assembly. Use extreme care while installing/removing the genset brushes.***

⚠CAUTION ***Continuous generator set overloading can cause high operating temperatures that could damage the generator windings. Keep the load within the nameplate rating.***

TROUBLE	POSSIBLE CAUSE	CORRECTIVE ACTION
NO AC OUTPUT VOLTAGE	1. Blown fuse or circuit breaker.	1. Look for cause and repair. Then replace fuse or reset circuit breaker.
	2. Disconnected wire or lead on brushes, bridge rectifier or reactor assembly.	2. Reconnect wire or wires.
	3. Brushes not making contact with collector ring.	3. Check brush springs for free movement or brushes which may be excessive worn.
	4. Open, grounded or short circuit in field or armature winding.	4. Test with tester or ohmmeter and replace if defective.
	5. Defective bridge rectifier assembly.	5. Test with ohmmeter and replace if defective.
	6. Bridge rectifier assembly installed wrong in its case.	6. Reinstall making sure marks on case and rectifier match.
LIGHTS FLICKER INTERMITTENTLY	1. Loose or broken lead/ leads in generator.	1. Repair broken lead or ·reconnect loose lead.
LOW AC OUTPUT VOLTAGE	1. External short circuit on line.	1. Locate and eliminate short circuit problem.
	2. Generator overloaded.	2. Remove part of load.
	3. Shorted or grounded circuit in field or armature winding.	3. Test with ohmmeter or tester and replace if defective.
	4. Engine not running properly causing generator to slow down.	4. Refer to Engine Troubleshooting guide.
NOISY GENERATOR	1. Defective bearing in end ball.	1. Replace bearing.
GENERATOR OVERHEATS	1. Generator overloaded.	1. Remove part of load.
	2. Windings and parts covered with oil or dirt.	2. Clean generator.
	3. Air intake restricted or incoming air too hot.	3. Take necessary steps to allow for proper cooling.
	4. Shorted or grounded circuit in armature or field windings.	4. Test with ohmmeter or tester and replace if defective.
AC OUTPUT VOLTAGE HIGH WITH NO LOAD CONNECTED AND GENERATOR RUNNING AT 1800 RPM	1. Compounding reactor	1. Remove, test and replace.

GENERATOR SERVICE PROCEDURES AND TESTS

BRUSH REMOVAL AND REPLACEMENT

To reach the brushes, remove the plastic end bell screens. (See Figure 5-1 for location of generator components.) Measure brush wear as shown in Figure 5-2, by inserting a small, narrow scale into the top of the brush block. If the brushes need replacing, remove and tag the wires connected to the brush blocks. Then remove the brush blocks and lift them out of the end bell. Pull the brushes and springs out from the bottom of the brush block. Clean the brush block at this time.

⚠CAUTION ***The brushes are easily damaged during genset disassembly/assembly. Use extreme care while installing/removing the genset brushes.***

New brushes are shaped to fit, and seldom need sanding to seat properly. Always replace brushes as a set, and use only the correct brushes. Never use a substitute brush, which may appear to be the same, but have different electrical characteristics.

Note that brush blocks are stamped "BRG END" on one side. Be sure that this stamped side faces the bearing end of the generator for correct brush alignment. Tighten the brush block screws to 40 to 70 in.lb or 4 to 6 ft.lb (5 to 8 N•m). If sparking occurs after replacing the brushes, run the generator with a light load until they seat properly. Check the brush springs for freedom of movement.

ARMATURE GROUND TEST

While the armature is removed for checking shorts using a growler, additional checks can be made. If the armature is still installed, lift the brushes before conducting these tests. These tests use either the continuity tester buzzer or the test light.

Place one test prod on one of the collector rings and the other test prod on the armature shaft (Figure 5-3). The tester buzzer should not buzz (lamp should not light). If it buzzes (or lights), the AC winding or a collector ring is grounded to the shaft. Test each collector "ring" in this manner.

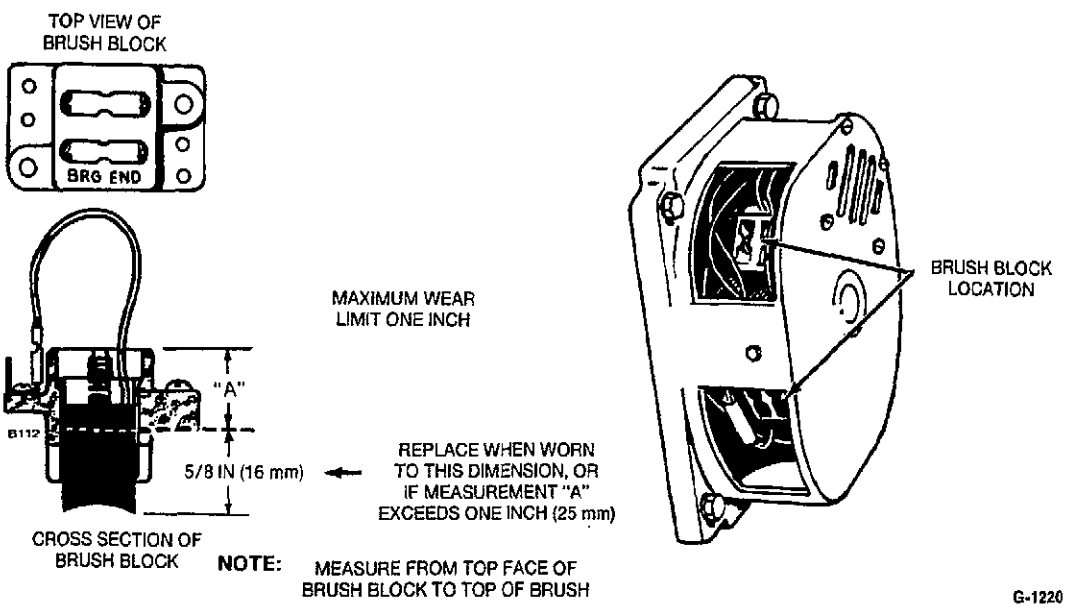
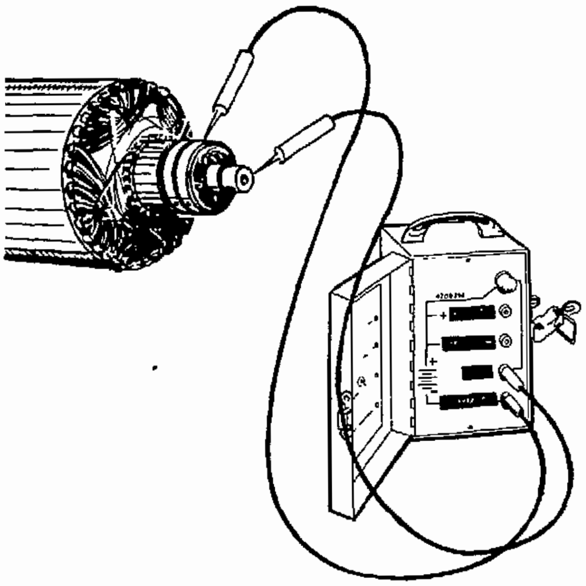


FIGURE 5-2. BRUSH WEAR LIMITS

⚠WARNING ***Electrical shock can cause severe personal injury or death. Use extreme caution when working on electrical circuitry. Attach and remove meter leads only when the generator set is not operating. Do not touch the meter or meter leads during testing.***



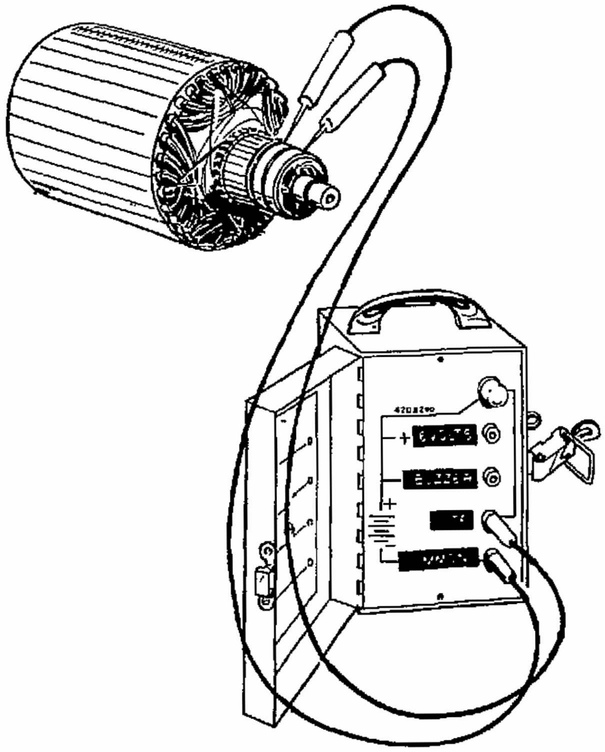
G-1221

FIGURE 5-3. ARMATURE GROUND TEST

ARMATURE OPEN TEST

Place one test prod on each collector ring (Figure 5-4). The tester should buzz or light. If it does not do so, the armature has an open or a bad connection.

⚠WARNING ***Electrical shock can cause severe personal injury or death. Use extreme caution when working on electrical circuitry. Attach and remove meter leads only when generator set is not operating. Do not touch meter or meter leads during testing.***



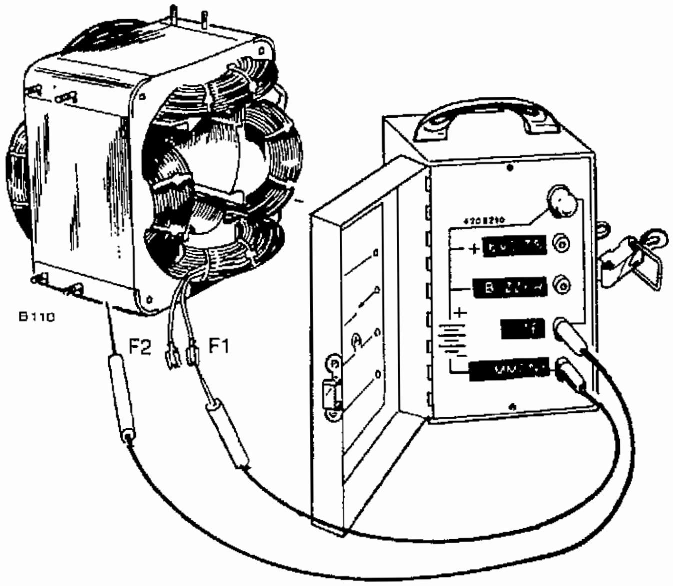
G-1222

FIGURE 5-4. ARMATURE OPEN TEST

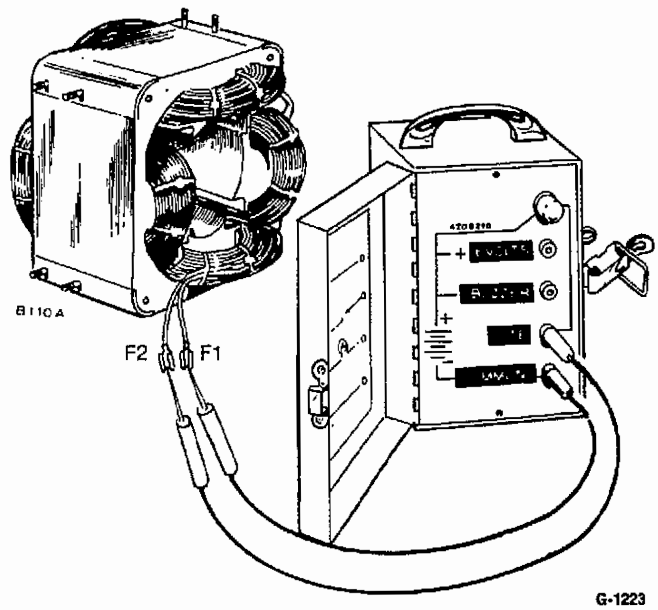
TESTING FIELD WINDINGS FOR GROUNDS

Before testing, disconnect all field leads. Touch one test prod to F1 (+) and the other prod to the frame (Figure 5-5). The buzzer should not sound or the lamp should not light. If the tester buzzes or lights, the field is grounded, and must be replaced. Test lead F2 (-) in the same manner.

⚠WARNING ***Electrical shock can cause severe personal injury or death. Use extreme caution when working on electrical circuitry. Attach and remove meter leads only when generator set is not operating. Do not touch meter or meter leads during testing.***



TESTING FOR GROUNDS



TESTING FOR OPENS

FIGURE 5-5. TESTING FIELD WINDINGS

TESTING FIELD WINDINGS FOR AN OPEN CIRCUIT

Use either a continuity tester or an ohmmeter for this test.

Using an Ohmmeter

Disconnect the external leads and connect the ohmmeter leads to F1 (+) and F2 (-).

At 70° F (21° C), resistance should be 28.8 ohms (± 3%) for the BF and 38 ohms (± 3%) for the NH.

⚠WARNING ***Electrical shock can cause severe personal injury or death. Use extreme caution when working on electrical circuitry. Attach and remove meter leads only when generator set is not operating. Do not touch meter or meter leads during testing.***

Using a Continuity Tester

Disconnect the external leads and touch the test prods to F1 and F2. The lamp should light or the buzzer should sound. If not, the field winding is open, and must be replaced. Check the terminal ends closely for loose connections. These can be tightened without replacing the assembly.

TESTING BRIDGE RECTIFIER

To accurately test the bridge rectifier proceed as follows:

1. Loosen the screw to remove the bridge rectifier assembly (see Figure 5-6 for location).

2. Disconnect the nylon connector from the bridge rectifier assembly, noting the polarity marking of the bridge rectifier assembly and connector.

3. Pull the assembly out from the end bell and remove the bridge rectifier from its case.

⚠CAUTION ***The bridge rectifier and attached components may be damaged or destroyed by incorrect mounting. Note that the connector can only be mounted in the end bell in one direction, but the bridge rectifier can be mounted in four (4) directions, of which only one will work. Use extreme care to mount the bridge rectifier correctly.***

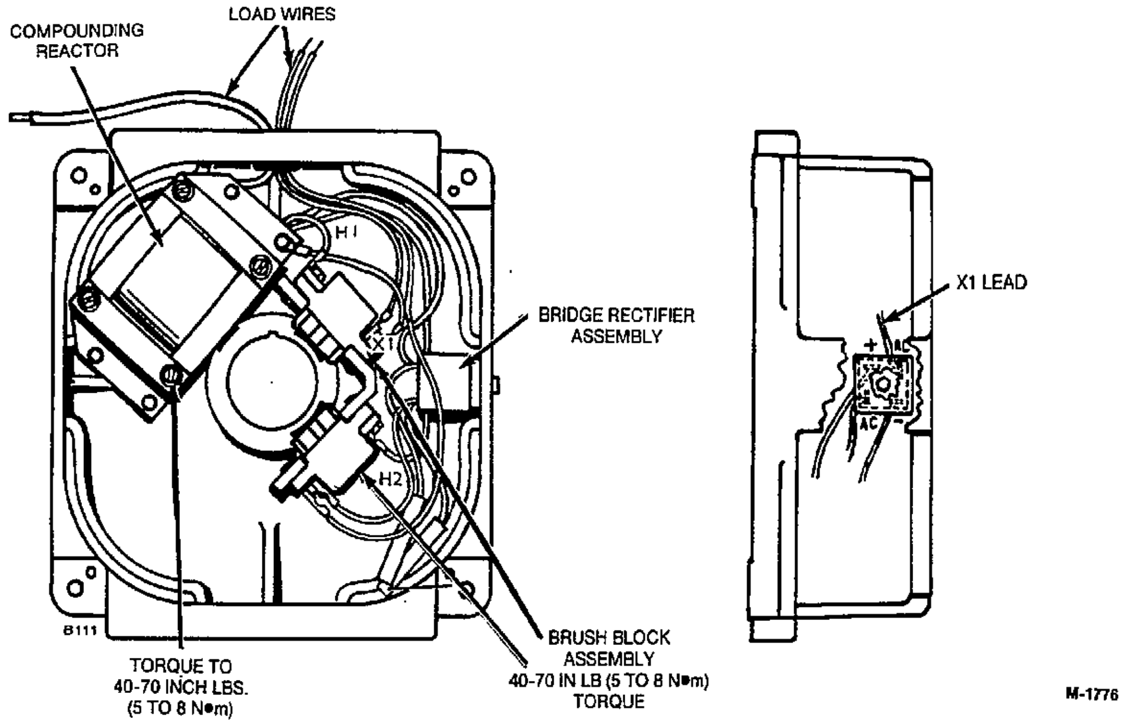


FIGURE 5-6. END BELL ASSEMBLY

⚠CAUTION ***All terminals are marked on both the bridge rectifier and the nylon case. Observe the proper polarity when reinstalling. If installed incorrectly, generator voltage will not build up to the proper level.***

4. Use an ohmmeter to test the bridge rectifier. Set the ohmmeter dial to R x 1 scale.

5. Place the meter leads on the points shown in Figure 5-7 and note the readings from the table below.

6. If any tests do not agree with the above readings, install a new bridge rectifier.

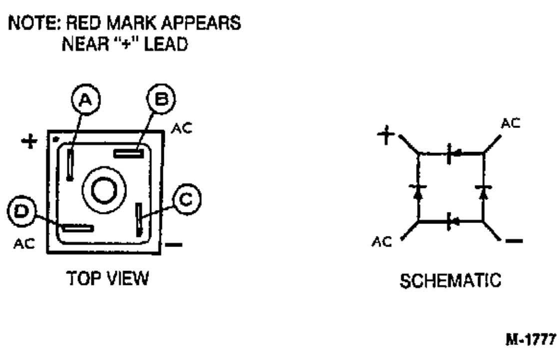


FIGURE 5-7. TESTING BRIDGE RECTIFIER

OHMMETER BLACK LEAD*	OHMMETER RED LEAD	RESISTANCE
A	B	*8 Ohms
A	D	*8 Ohms
B	C	*8 Ohms
D	C	*8 Ohms
B	A	Infinity
D	A	Infinity
C	B	Infinity
C	D	Infinity

* - ± 10% - Readings taken at 70°F (21°C).

COLLECTOR RINGS

Collector rings acquire a glossy brown finish in normal operation. Do not attempt to maintain a bright, new-looking surface on the rings. Cleaning with a dry, lint-free cloth is usually sufficient. Very fine sandpaper (#240 or finer) may be used to sand the collector rings while the genset is running, to remove slight roughness. Use only light pressure on the sandpaper. Do not use emery or carborundum paper or cloth. Clean out all carbon dust from the generator.

⚠WARNING ***Contact with rotating machinery can result in death or severe personal injury. Use extreme care, and keep hands and fingers clear while sanding the collector rings.***

GENERATOR BEARING

The generator is pre-lubricated and double-sealed. Replace the bearing approximately every 5 years, or each engine overhaul, or whenever the generator is disassembled.

COMPOUNDING REACTOR

With the generator running at 1800 rpm, if the output voltage is high with no electrical load attached, then the compounding reactor is probably defective. Test as shown in Figure 5-8 using a variac.

WITH ONE AMPERE INPUT THE VOLTAGE SHOULD READ

	VOLTAGE
4KW (315-380)	65-75
6KW (315-378)	60-70

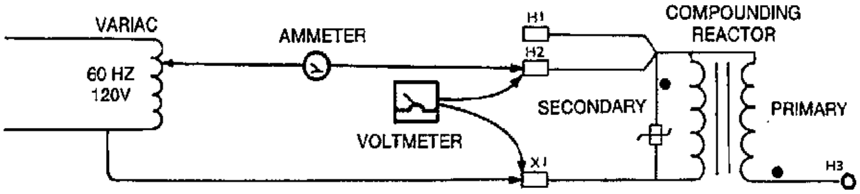
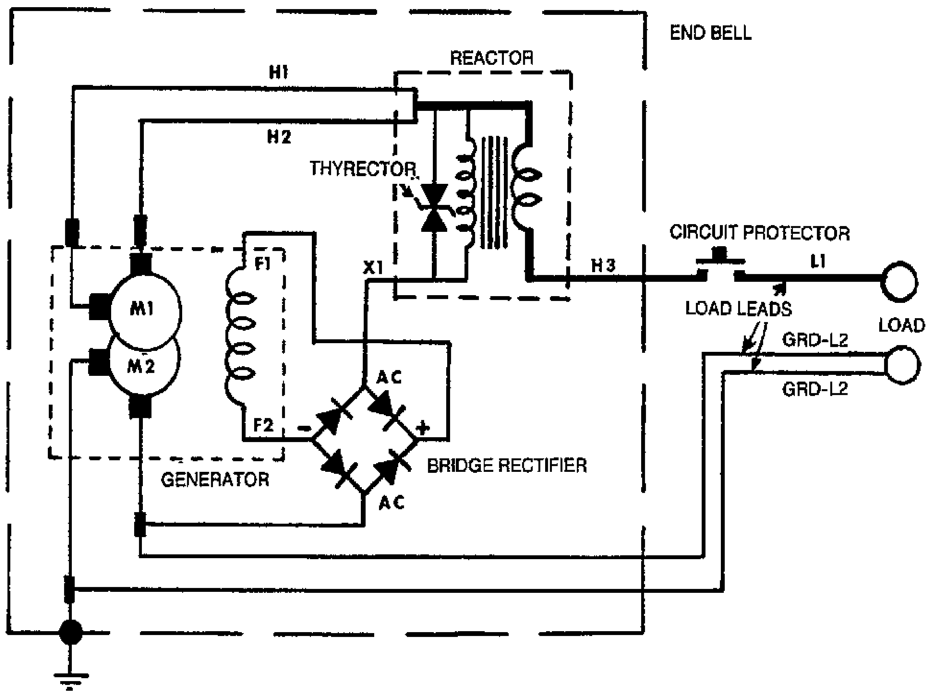


FIGURE 5-8. TESTING COMPOUNDING REACTOR

ES-1821



ES-1822

FIGURE 5-9. AC GENERATOR SCHEMATIC

APPROXIMATE GENERATOR VALUES

MODEL	TYPICAL N.L. VOLTS	TYPICAL F.L. VOLTS	N.L. VOLTS X1 to H1	N.L. VOLTS F1 to F2	RESISTANCE F1 to F2	RESISTANCE H1 to X1	CURRENT FULL LOAD
4 kW	125	112	100 VAC	40 V DC	28 Ohms	0.83 Ohms	33 Amps
6 kW	123	113	80 VAC	50 V DC	38 Ohms	0.85 Ohms	50 Amps

N.L. - No Load
F.L. - Full Load

GENERATOR TORQUE VALUES

DESCRIPTION	TORQUE VALUE
Generator Through Studs (4)	15 to 18 ft lb (20 to 24 N•m)
Armature Hold-down Nut - 12 Point	45 to 50 ft lb (61 to 67 N•m)
Compounding Reactor Studs	4 to 6 ft lb (5 to 8 N•m)
Brush Block Assembly Studs	4 to 6 ft lb (5 to 8 N•m)

CONTROL SYSTEM OPERATION DESCRIPTION

When relay operation is described, "N.O." refers to normally open relays, and "N.C." refers to normally closed relays.

STARTING

When switch S3 (Figure 5-10) is moved to the START position, B+ current flows through K1 solenoid, K2 contacts and switch S3 to battery negative (-). K1 solenoid closes contacts, feding current to the starter motor and to choke E1 and relay K3. Relay K3 contacts close the circuit to the ignition coil T1 and fuel pump E2/fuel solenoid K4. The engine cranks and the fuel pump, fuel solenoid and ignition operate, starting the engine.

IGNITION

After the engine starts and its rpm increases, the flywheel alternator develops a voltage which is rectified to DC, energizing relay K2. K2 N.O. contacts close to hold relay K3 energized, and K2 N.C. contacts open to drop K1 start solenoid. K3 contacts maintain current to the ignition coil, the fuel pump and the fuel solenoid. As the engine runs, K2 remains energized.

STOPPING

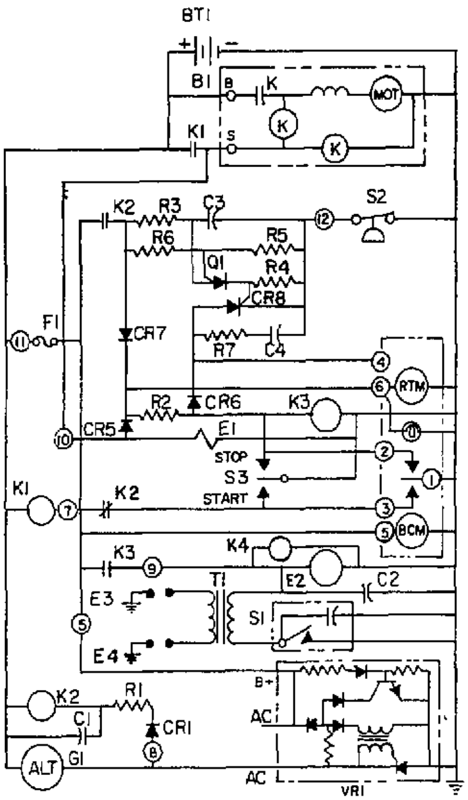
Relay K3, energized by K2, maintains the ignition. Pushing the stop switch shorts K3, which drops out to remove power from the fuel pump, fuel solenoid and ignition coil. Resistor R2 absorbs the power that was supplied to K3 while the stop switch is held closed, as the engine stops.

LOW OIL PRESSURE SHUTDOWN

If oil pressure is low, switch S2 closes to charge capacitor C3 through resistor R3. This provides a time delay of 2 to 4 seconds. When the voltage on capacitor C3 matches the voltage of the divider R5-R6, programmable unijunction transistor Q1 fires, to trigger CR8. CR8 turns on to deenergize K3 relay. K2 contacts open as the engine stops and CR8 turns off.

BATTERY VOLTAGE SENSING

The battery voltage sensing portion of the voltage regulator determines whether the voltage regulator should turn on or off. To test battery charging, connect a DC voltmeter from B+ of the regulator to ground. A reading of 14.1 to 14.5 volts is acceptable.



BT1	Battery
B1	Starter
E1	Electric Choke
E2	Fuel Pump
E3, E4	Spark Plugs
F1	5 amp. Fuse
G1	Battery Charging Alternator
K1	Start Solenoid
S1	Breaker Box
S2	Low Oil Pressure Switch
S3	Start-Stop Switch
T1	Ignition Coil
VR1	Voltage Regulator
RTM	Running Time Meter (Opt.)
BCM	Battery Condition Meter (Opt.)
K4	Fuel Solenoid

FIGURE 5-10. CONTROL SYSTEM SCHEMATIC

EMERGENCY START-STOP OPERATION

In an emergency, the control board can be bypassed to start or stop the genset. Connect a jumper between terminals 9 and 11 to energize the ignition, fuel solenoid and fuel pump. Then temporarily jumper terminals 1 and 7 to energize starter. Remove this jumper as soon as the engine starts and runs. DO NOT jumper these terminals while the engine is running. To stop the genset, remove the jumper from terminals 9 and 11.

⚠CAUTION ***This emergency operation DOES NOT provide fuse protection, start disconnect or low oil pressure shutdown, and should not be used without monitoring the generator set.***

FUSE PROTECTION

A 5-ampere fuse, installed on the control board, protects the board from shorts in the remote wiring. If the fuse is blown, correct the situation that blew the fuse, then remove the cover on the control and replace it with an identical fuse (Figure 5-11).

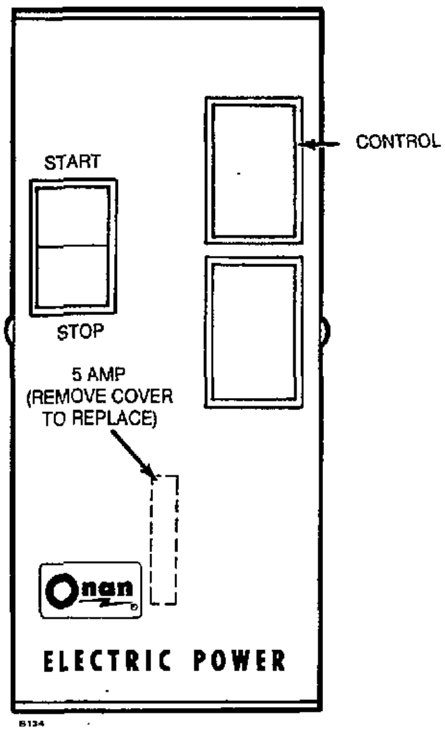


FIGURE 5-11. FUEL LOCATION

CONTROL SYSTEM TROUBLESHOOTING

After removing the control cover, use a long-nosed pliers to remove the flag connectors from the terminals on the board. Pull these connectors straight out to avoid breaking the control board terminals. Do not attempt to adjust the contacts on relays K2 and K3; they are precision-set at the factory. Blow dirt out of the relay contacts with a low-pressure compressed air source.

To correct a problem, answer the question in the appropriate troubleshooting chart either "YES" or "NO". Refer to the number in that column and proceed to that step.

⚠WARNING ***Many troubleshooting procedures present hazards which can result in severe personal injury or death. Only qualified service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Review safety precautions on inside cover page.***

PROBLEM	SEE PAGE
A. Engine does not crank.	5-11
B. Engine cranks but does not start.	5-12
C. Engine runs for 3 or 4 seconds, then stops	5-13
D. Low battery - no charge rate.	5-13

A.	ENGINE DOES NOT CRANK	YES	NO
1.	Check battery. Are battery terminals clean and are cables tight?	2.	—
2.	Check battery cables for polarity. Is 12 volts present across battery terminals with engine stopped and is 8 volts or higher present with engine cranking?	3	10
	⚠WARNING ***Arcing or inadvertent starting of the generator set can cause damage to the generator set, severe personal injury, or death. For this reason, disconnect the negative (-) battery cable before beginning these procedures, and do not reconnect the negative (-) battery cable until these procedures are complete.***		
3.	Remove cover on printed circuit board. Jumper terminal 7 to 3. Press start switch. Does engine crank?	4	5
	⚠WARNING ***Electrical shock can cause severe personal injury or death. Use extreme caution when working on electrical circuitry. Attach and remove jumpers only when generator set is not operating. Do not touch jumpers during testing.***		

A.	ENGINE DOES NOT CRANK	YES	NO
4.	K2 contact is defective. Replace printed circuit board.	—	—
5.	Jumper terminal 7 to 1. Does engine crank?	6	7
6.	Start switch S3 is defective. Replace printed circuit board.	—	—
7.	Jumper from S terminal of B1 starter motor to positive (+). Does engine crank?	8	9
8.	Replace K1 start solenoid.	—	—
9.	Starter is defective. Remove and perform tests listed in *Starter* section of master service manual and/or replace starter.	—	—
10.	Replace battery.	—	—
B.	**ENGINE CRANKS BUT DOES NOT START**	**YES**	**NO**
1.	Is F1 fuse on control board OK?	3	2
2.	Replace with an identical 5-ampere fuse. Correct problem which caused fuse to burn. **Note: Remote leads may be shorted or grounded.**	—	—
3.	While engine cranks, check K1-l start solenoid voltage. Is 12 volts present between terminals 10 and 1?	5	4
4.	Replace K1 start solenoid.	—	—
5.	Jumper terminals 9 to 11. Does engine start when start switch is pushed?	6	7
6.	K3 contacts are defective. Replace printed circuit board.	—	—
7.	Fuel solenoid K4 must be open during starting and running. Remove fuel line from carburetor. Does fuel pulsate from line when start switch is pushed?	11	8
	⚠WARNING ***Fuel presents the hazard of fire or explosion which can cause severe personal injury or death. Do not permit any flame, spark, pilot light, cigarette, or other ignition source near the fuel system. Keep an ABC type fire extinguisher nearby.***		
8.	Disconnect fuel solenoid from line and check fuel pump E2. Pump will click when operating properly. Does fuel pulsate from pump (solenoid disconnected) when start switch is pushed?	10	9
9.	Fuel pump (or wiring) is defective and must be replaced.	—	—

B.	**ENGINE CRANKS BUT DOES NOT START**	**YES**	**NO**
10.	Fuel solenoid is defective and must be replaced.	—	—
1.	Is electric choke closed when engine is cranking?	13	12
12.	Voltage at choke terminal when engine is cranking should be 12 volts. If choke does not move (at room temperature) with 12 volts applied, replace it. Also check wire from choke to control for shorts to ground.	—	—
13.	The fault is in the ignition system. Check points, plugs, wires and coil. Refer to *Ignition* section of master service manual.	—	—

C.	**ENGINE RUNS 3 OR 4 SECONDS - THEN STOPS***	**YES**	**NO**
1.	Check oil level. Refill to FULL mark on dipstick. Does engine now continue to run?	—	2
	⚠CAUTION ***Operating the engine with inadequate oil and oil pressure can damage or destroy it. Make sure the engine has sufficient oil and oil pressure. Otherwise, engine damage will occur.***		
2.	Check voltage from terminal 11 to 12. Is it 12 volts with engine stopped and does voltage drop to zero when engine runs?	—	3
3.	Check oil pressure sensor wire for shorts to ground by visually tracing wire from S2 low oil pressure switch to control. Is wire grounded?	4	5
4.	Replace or repair wire making sure it isn't rubbing against anything that may again cause a ground problem.	—	—
	* - *Remote lead 1 may be shorted to remote lead 2. Lead 2 may be grounded.*		

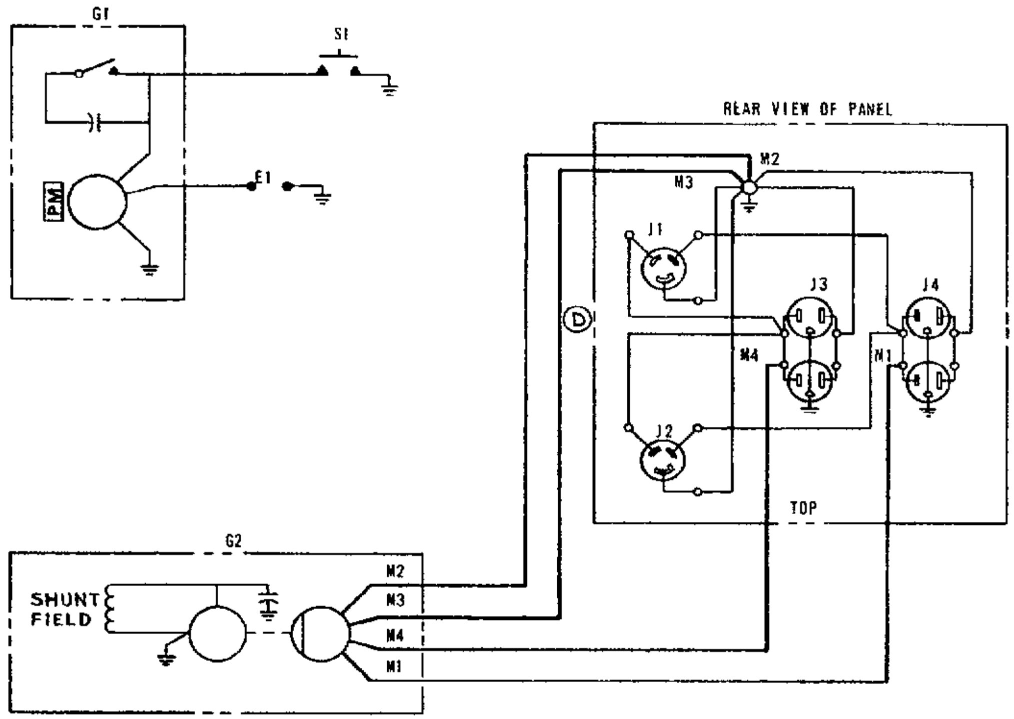
D.	**LOW BATTERY—LOW CHARGE RATE**	**YES**	**NO**
1.	With engine cranking, measure voltage at terminal 8 to BAT terminal of K1 start solenoid. Is 6 volts present?	2	3
2.	Check battery connections. They must be clean and tight.	—	—
3.	Check flywheel alternator G1 output. Disconnect AC lead that connects to voltage regulator VR1 and connect voltmeter to this lead and BAT terminal of K1 start solenoid. This checks AC open circuit voltage. Start engine. Is AC output voltage approximately 28 volts with unit running at 1800 rpm?	5	4
4.	Replace alternator stator G1.	—	—
5.	Connect a voltmeter across battery terminals. Start engine. Does DC voltage increase to 13 to 14-1/2 volts after engine is running for a few minutes?	—	6
6.	Remove and replace voltage regulator VR1.	—	—

Section 6. Wiring Diagrams

All the wiring diagrams included in this section apply to generator sets equipped with the UN generator. To find the correct wiring diagram, proceed to the page corresponding to the generator set series.

SERIES	WIRING DIAGRAM	SEE PAGE
BF-1R/9000A (9500A)	611-1094	6-11
BF-1R/9000B	611-1109	6-13
BF-3CR/16000A	611-1123	6-14
BF-3CR/16000B	611-1127	6-15
BFA-1R/16000A	611-1135	6-19
BFA-1R/16000B	611-1146	6-17
BGA-3CR/16000A	611-1135	6-19
BGA-3CR/16000B	611-1146	6-17
CCK-3CE/2236R	606-0203	6-4
CCK-3CE/13276R	606-0203	6-14
CCK-3CP/1R	602-0245	6-3
CCK-R/1R	611-1090	6-10
CCK-3CR/12000R	611-1086	6-9
CCK-3CR/16000U	611-1127	6-15
LK-3CR/1M	610-0350	6-6
MCCK-3CR/1E	611-1096	6-12
MCCK-3CR/1F	611-1096	6-12
MCCK-3CR/1G	611-1143	6-16
MCCK/H	611-1145	6-20
MCCK/J	611-1185	6-18
NB-3CM/1A	601-0197	6-2
NB-3CR/1A	610-0326	6-5
NH-3CR/16000A	611-1135	6-19
NH-1R/9000A (9500A)	611-1094	6-11
NH-1R/9000B	611-1109	6-13
NH-3CE/2236D	606-0203	6-4
NH-R/6000A	611-1052	6-8
NH-R/A	611-1019	6-7
NH-R/1R	611-1090	6-10
NH-3CR/12000D	611-1086	6-9
NH-3CR/16000J	611-1127	6-15

60IB197



PARTS LIST

REF. DES.	QTY	DESCRIPTION
E1	1	SPARK PLUG
G1	1	MAGNETO ASSY
G2	1	GENERATOR
J1,2	2	RECEPTACLE-TWISTLOCK
	1	SILKSCREEN
J3,4	2	RECEPTACLE-DUPLEX
	1	SILKSCREEN
S1	1	SWITCH-STOP
	2	JUMPER
	1	PANEL-RECEPTACLE
	1	RECEPTACLE BOX
	1	BRACKET-UPPER
	1	BRACKET-LOWER

NOTE.
M2 IS GROUNDED AC LEADS. ALL OTHER AC LEADS HAVE 0 1 MFD CAPACITOR TO GROUND IN GEN

	A	MODEL NO
-01	2.3NB-53CM/1A	3.0NB-3CM/1A
	120/240V, 1PH, 4W, 50CY	120/240V, 1PH 4W, 60CY

60IB197

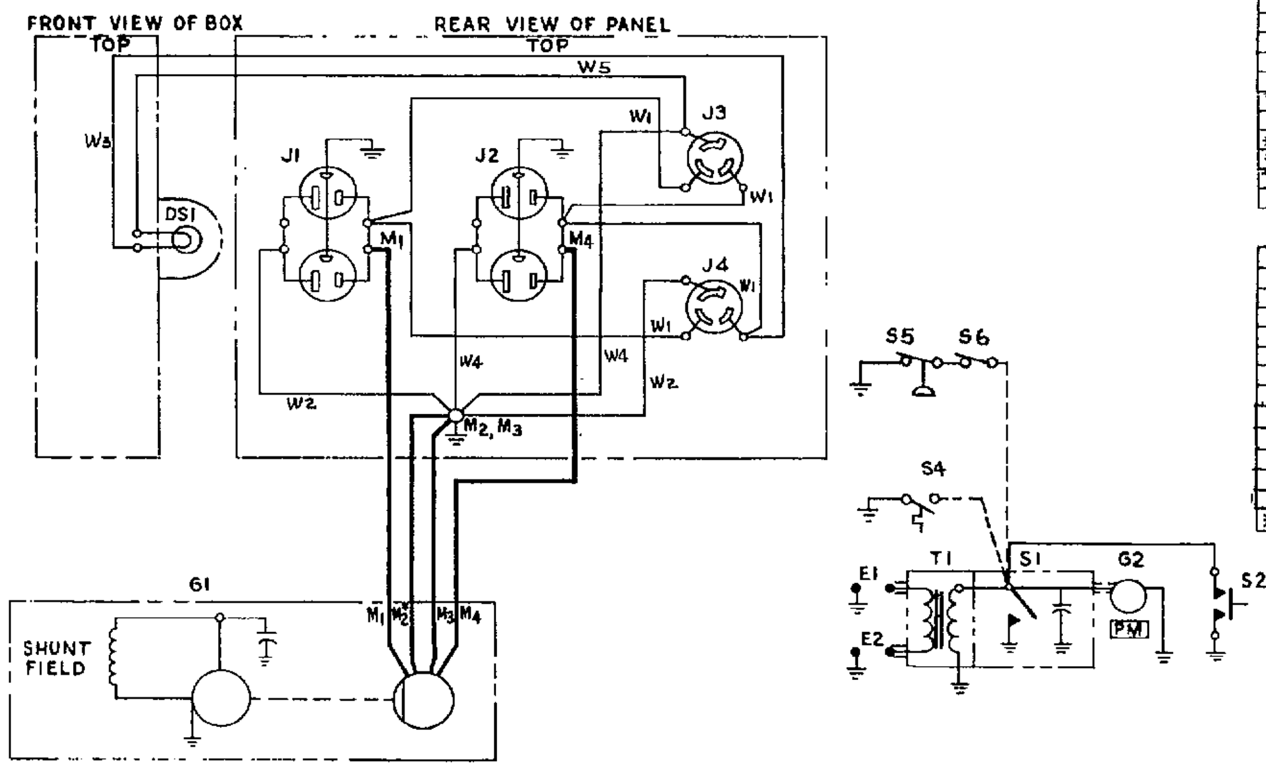
Onan DIVISION OF STUDEBAKER CORPORATION Minneapolis, Minnesota

DATE	DR	CKD
3-2-70	CDR	G.R.T.

NAME: WIRING DIAGRAM CONTROL - GEN SET

DWG NO 60IB197

602-0245



PARTS LIST

REF DES.	QTY	DESCRIPTION
DS1	1	LAMP 120V.
	1	RECEPTACLE - PILOT LIGHT
	1	GUARD - PILOT LIGHT
	1	CLAMP
	1	GASKET
J1,2	2	RECEPTACLE, DUPLEX 120 V.
	1	SILKSCREEN
	2	JUMPER
J3,4	2	RECEPTACLE, TWISTLOCK 240V.
	1	SILKSCREEN
* S5	1	LOPKO
* S6	1	MOMENTARY OPEN SWITCH
	1	RECEPTACLE BOX
	1	PANEL - RECEPTACLE BOX

REF DES.	QTY	DESCRIPTION
	1	TERMINAL
ENG GEN		PARTS LIST (REF)
E1,2	2	SPARK PLUG
G1	1	GENERATOR
G2	1	MAGNETO
S1	1	BREAKER AND CAP ASSEMBLY
S2	1	SWITCH - STOP
T1	1	COIL - IGNITION
W1	4	LEAD ASSY
W2	2	LEAD ASSY
W3,5	2	LEAD ASSY
W4	2	LEAD ASSY
	4	TERMINAL - RING
* S4	1	HATKO

*WHEN USED

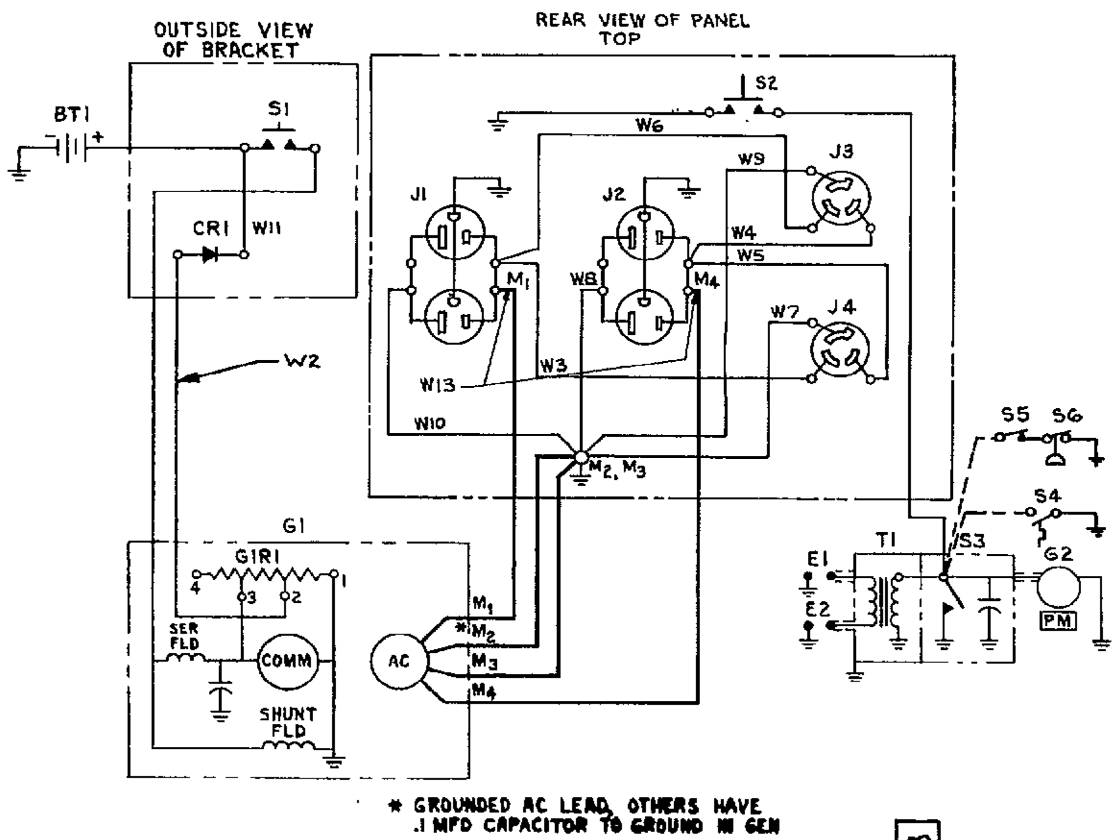
*GROUND AC LEAD, ALL OTHERS HAVE 0.1 MFD CAPACITOR TO GROUND IN GEN

602-0245

Onan DIVISION OF STUDEBAKER CORPORATION

MODEL NO.		DATE	BY	CKD
-01	4.0 & 5.0CCK-3CP/IR	4-12-72	CDR	G.F.T.
	120/240 V., 1 PHASE 4 W., 60 CY.	NAME: CONTROL-GEN SET (WIRING DIAGRAM)		
		DWG NO 602-0245		B

606-0203 | B



REF. DES.	QTY	PARTS LIST DESCRIPTION
CR1		
	1	RECTIFIER
J1, J2	1	BRKT-RECTIFIER MTG.
J3, J4	2	RECEPTACLE, DUPLEX, 120 V
S1	2	RECEPTACLE, TWISTLOCK, 240V
S2	1	SWITCH, START
	1	SWITCH, STOP
	1	BRACKET ASSY - CONTROL (-01)
	1	BRACKET ASSY - CONTROL (-02)
	1	PANEL ASSY - RCPT
	1	CONTROL - BOX
BT1		ENG GEN PARTS LIST (REF)
E1, 2	1	BATTERY
G1	2	SPARK PLUG
G1, R1	1	GENERATOR
G2	1	RESISTOR-GENERATOR
S3	1	MAGNETO
*S4	1	BREAKER & CAP ASSY
*S5	1	HATKO
*S6	1	MOMENTARY CONTACT SW
T1	1	LOPKO
	1	COIL-IGNITOR

* WHEN USED

L	ADDED 301-3576(c)	CDK WH	11-15-78
M	REV PARTS LIST	WH	9-6-78
L	DELETE W12	CDK WR	3-17-78
K	ADDED 332 P 517	KP	12/9/77
J	W11 WAS 226-1155	WJ	5-19-76

606-0203 | B

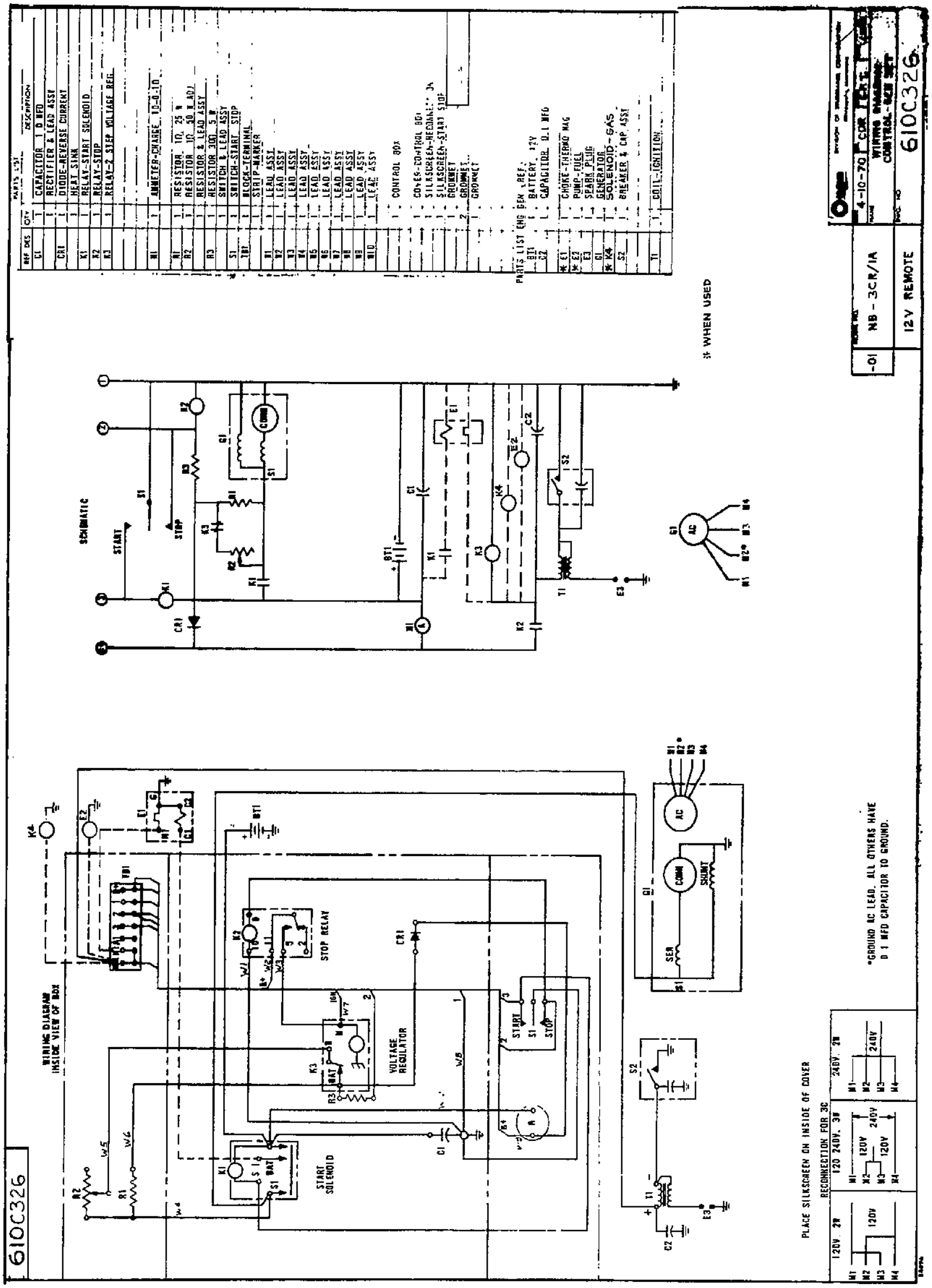
	MODEL NO
-01	4.0 & 5.0CCK-3CE/2236R
-02	5.5 NH-3CE/2236D 5.0 CCK-3CE/13276R
	120/240 V, 1 PH, 4 W, 60 CY

Onan DIVISION OF STUDEBAKER CORPORATION Minneapolis, Minnesota

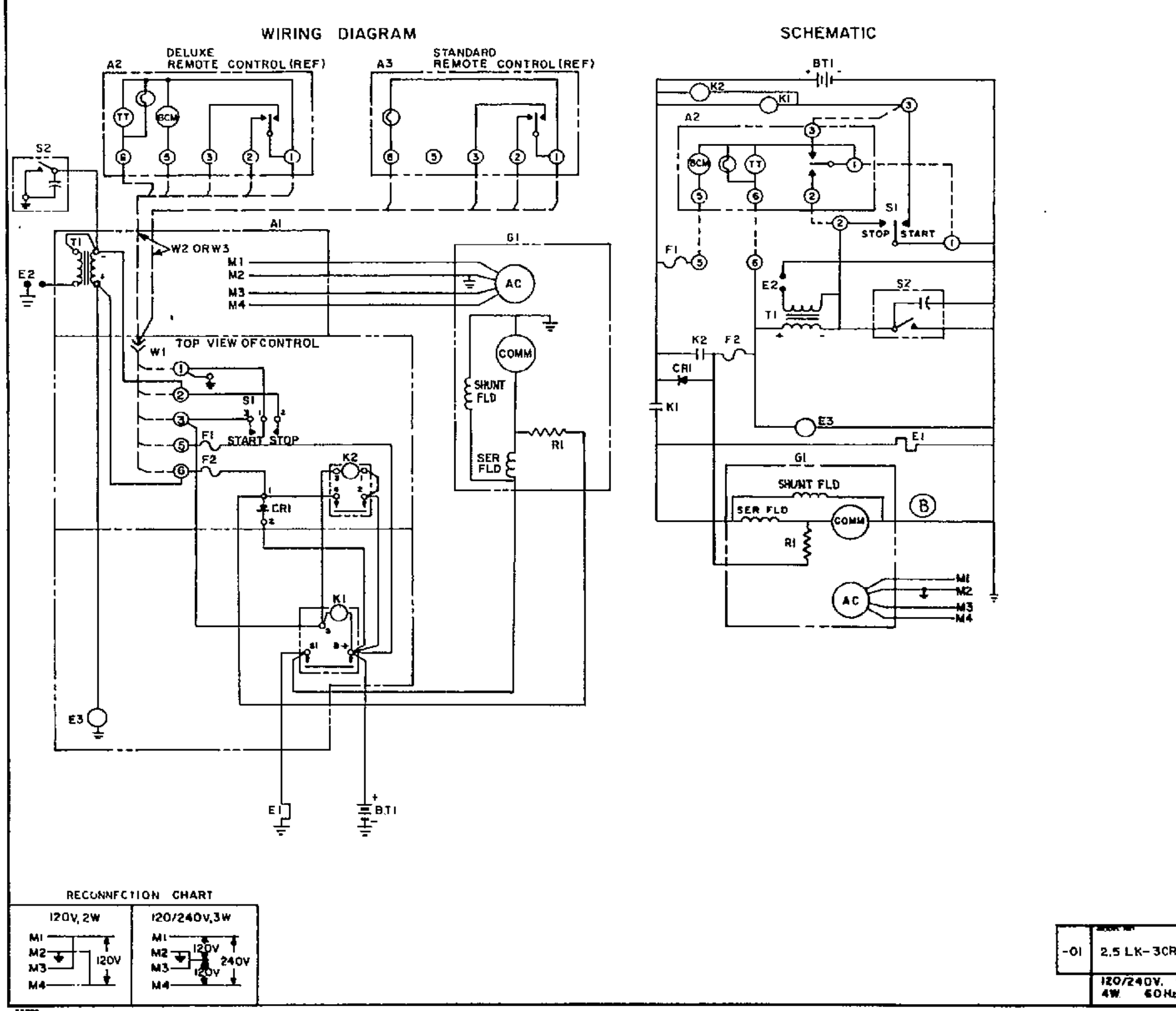
DATE 4-17-72 | DR CDR | CHK G.K.T.

NAME CONTROL - GEN SET (WIRING DIAGRAM)

DWG. NO 606-0203 | B


610C326
WIRING DIAGRAM
INSIDE VIEW OF BOX
SCHEMATIC
START
STOP
START SOLENOID
STOP RELAY
VOLTAGE REGULATOR
* WHEN USED
*GROUND AC LEAD. ALL OTHERS HAVE 0.1 MFD CAPACITOR TO GROUND.
PLACE SILKSCREEN ON INSIDE OF COVER
RECONNECTION FOR 3C
NB-3CR/1A
12V REMOTE
WIRING DIAGRAM CONTROL
610C326

610-0350 C



PARTS LIST

REF. DES	QTY	DESCRIPTION
A1	1	CONTROL ASSY
A2	1	DELUXE REMOTE CONTROL
A3	1	STANDARD REMOTE CONTROL
BT1	1	BATTERY 12V
CR1	1	RECTIFIER
E1	1	CHOKE-ONAN
E2	1	SPARK PLUG
E3	1	SOLENOID-FUEL
F1,2	2	FUSE (5 AMP, 32 V)
G1	1	GENERATOR
K1	1	SOLENOID-START
K2	1	RELAY-CRANK IGNITION
R1	1	RESISTOR-
S1	1	SWITCH-START-STOP
S2	1	BREAKER & CAP ASSY
T1	1	COIL-IGNITION
W1	1	WIRING HARNESS (CONN-REMOTE)
W2	1	WIRING HARNESS (CABLE-REMOTE CONTROL) (10 FEET LONG)
W3	1	WIRING HARNESS (CABLE-REMOTE CONTROL) (30 FEET LONG)

610-0350 C

-01	2.5 LK-3CR/1L
	120/240V. 1PH. 4W 60Hz

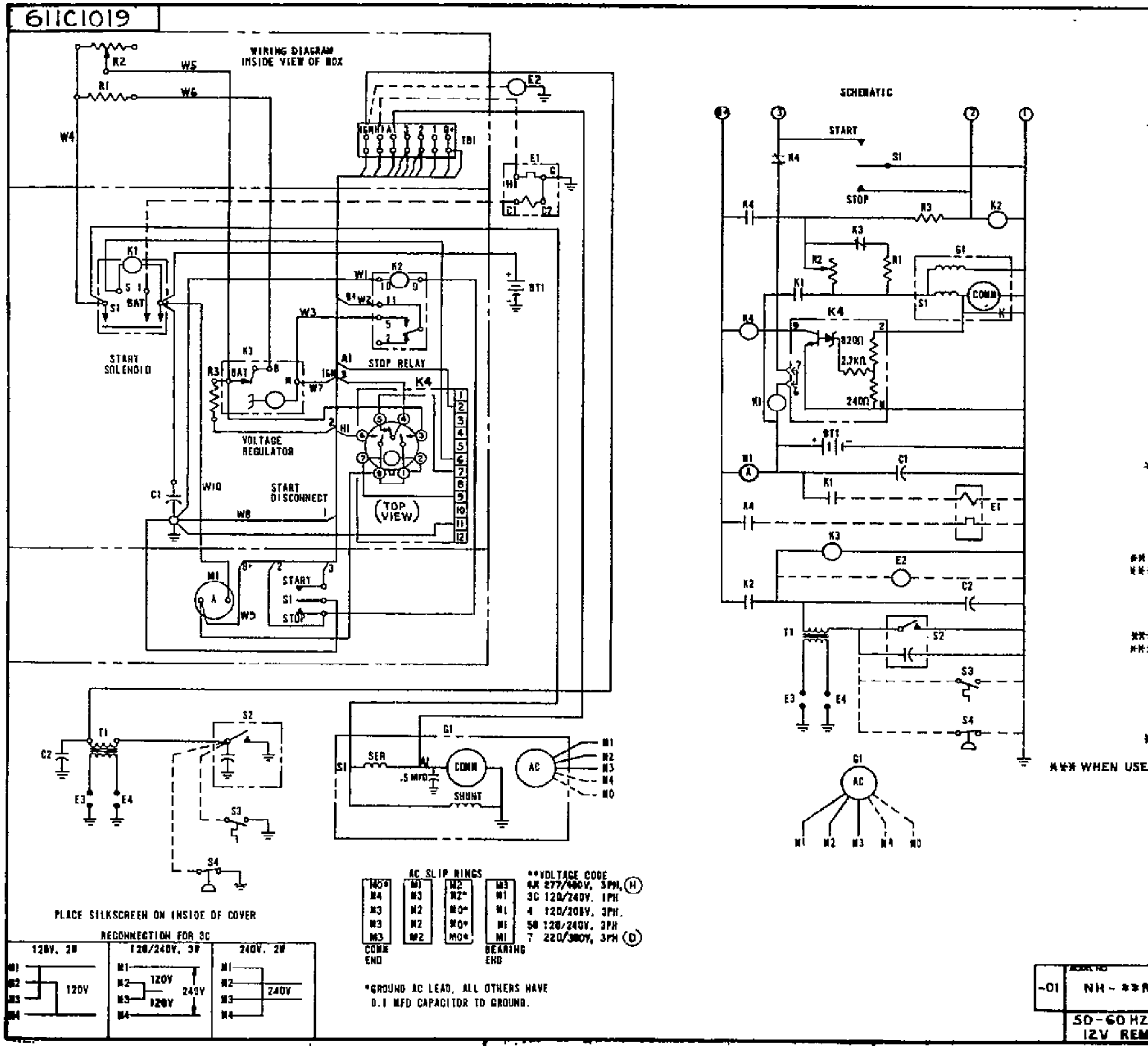
Onan — DIVISION OF ONAN CORPORATION

12-23-75 RKE

CONTROL-GEN SET (WIRING DIAGRAM)

SEPIA FROM 611-11

610-0350 C



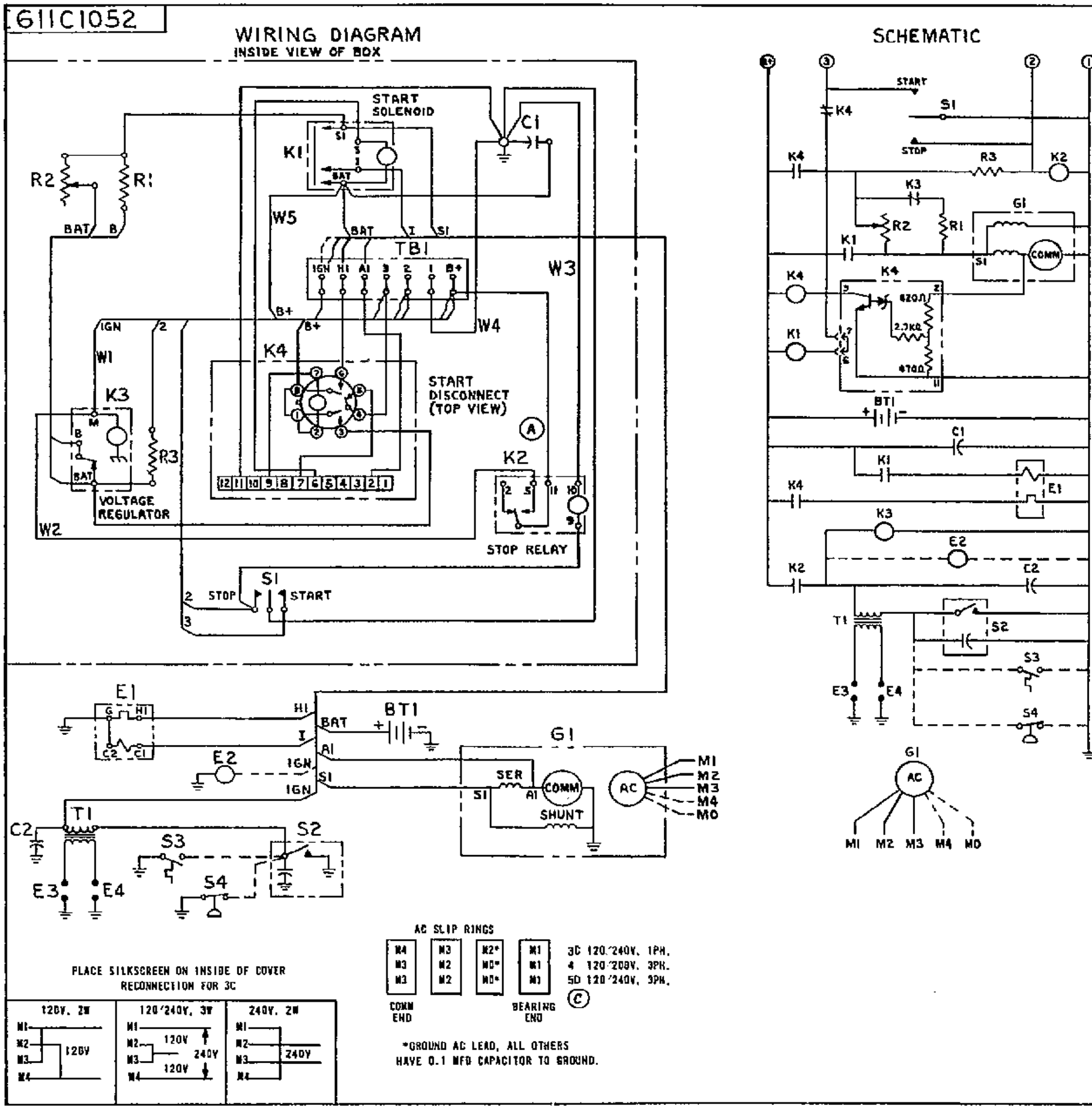
PARTS LIST

REF. DES.	QTY.	DESCRIPTION
C1	1	CAPACITOR, 1 0 MFD
K1	1	RELAY-START SOLENOID
K2	1	RELAY-STOP
K3	1	RELAY-2 STEP VOLTAGE REG
K4	1	RELAY ASSY-START DISC
	1	RELAY-START DISCONNECT
*	1	AMPLIFIER-START DISC
M1	1	AMMETER-CHARGE, 10-0-10
R1	1	RESISTOR, 6Ω, 50 W
R2	1	RESISTOR, 6Ω, 100 W ADJ
R3	1	RESISTOR & LEAD ASSY
	1	RESISTOR, 30Ω, 5 W
S1	1	SWITCH & LEAD ASSY
	1	SWITCH-START, STOP
TB1	1	BLOCK-TERMINAL
	1	STRIP-MARKER
W1	1	LEAD ASSY
W2	1	LEAD ASSY
W3	1	LEAD ASSY
W4	1	LEAD ASSY
W5	1	LEAD ASSY
W6	1	LEAD ASSY
W7	1	LEAD ASSY
W8	1	LEAD ASSY
W9	1	LEAD ASSY
W10	1	LEAD ASSY
	1	SILKSCREEN-RECONNECTION
	1	LABEL-START STOP
	1	GROMMET
	2	GROMMET
	1	GROMMET
	1	CONTROL BOX
	1	COVER-CONTROL BOX
*	1	SOCKET ASSY - START DISCONNECT
	1	SPRING
PARTS LIST ENG GEN (REF) 611C1019		
BT1	1	BATTERY, 12V
C2	1	CAPACITOR, 0.1 MFD
*** E1	1	CHOKE-THERMO MAG
*** E2	1	PUMP-FUEL OR GAS VALVE
E3,4	2	SPARK PLUG
G1	1	GENERATOR
S2	1	BREAKER & CAP ASSY
*** S3	1	SWITCH-HIGH AIR TEMP
*** S4	1	SWITCH-LOW OIL PRESS
T1	1	COIL- IGNITION
*	1	SPACER

*** WHEN USED

-01 NH - **R/IA
50-60 HZ, 4W 12V REMOTE

ONAN DIVISION OF STUDEBAKER CORPORATION
4-9-70 CDR G.P.T. J.W.D.
WIRING DIAGRAM CONTROL-GEN SET
611C1019



PARTS LIST

REF. DES.	QTY.	DESCRIPTION
C1	1	CAPACITOR ASSY, 1.0 MFD
K1	1	RELAY-START SOLENOID
K2	1	RELAY-STOP
K3	1	RELAY-2 STEP VOLTAGE REGULATOR
K4	1	RELAY ASSY-START DISC
	1	RELAY-START DISCONNECT
*	1	AMPLIFIER-START DISCONNECT
	1	RESISTOR & LEAD ASSY
R1	1	RESISTOR, 6Ω, 50 W
	1	RESISTOR & LEAD ASSY
R2	1	RESISTOR, 6Ω, 100 W ADJ
	1	RESISTOR & LEAD ASSY
R3	1	RESISTOR, 30Ω, 5 W
	1	SWITCH ASSY-
S1	1	SWITCH-START, STOP
TB1	1	TERMINAL BLOCK
	1	MARKER STRIP
W1	1	LEAD ASSY
W2	1	LEAD ASSY
W3	1	LEAD ASSY
W4	1	LEAD ASSY
W5	1	LEAD ASSY
	1	CONTROL BOX
	1	COVER-CONTROL BOX
	2	GROMMET
	1	GROMMET
	1	SILKSCREEN-RECONNECTION
	1	SILKSCREEN-START, STOP

PARTS LIST ENG GEN (REF)

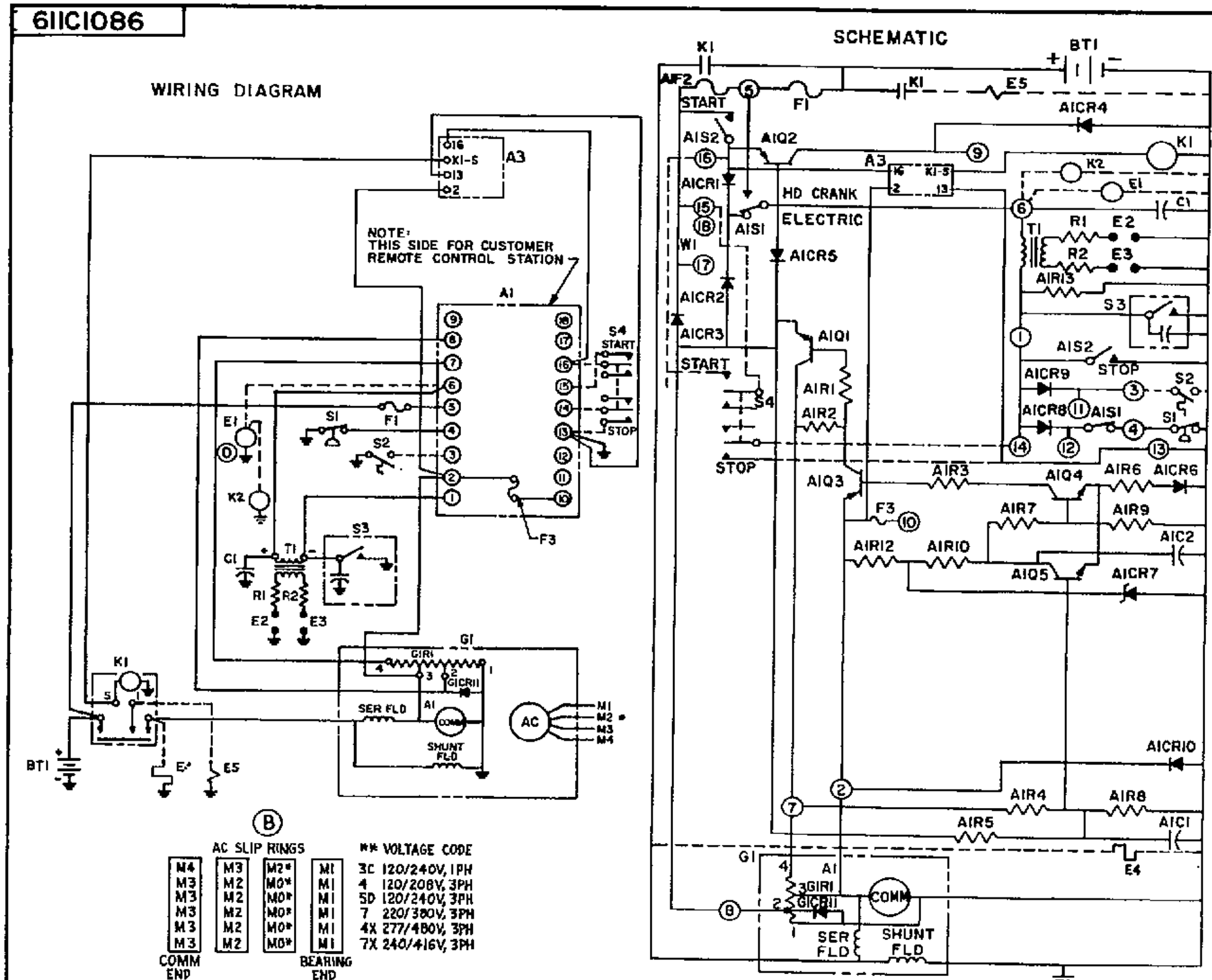
REF. DES.	QTY.	DESCRIPTION
BT1	1	BATTERY, 12V
C2	1	CAPACITOR, 0.1 MFD
E1	1	CHOKE-THERMO MAG
* E2	1	PUMP-FUEL
E3, 4	2	SPARK PLUG
G1	1	GENERATOR
S2	1	BREAKER & CAP ASSY
* S3	1	SWITCH-HIGH AIR TEMP
* S4	1	SWITCH-LOW OIL PRESS
T1	1	COIL-IGNITION
*	1	SOCKET ASSY - START DISC
	1	SPRING

*WHEN USED

611C1052

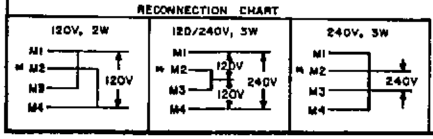
Onan — DIVISION OF STUDEBAKER CORPORATION		
DATE 8-24-70	DR. CDR	CHKD. RBM / ENGR. WJB
-01	NH-** R/6000A	NAME: CONTROL - GEN SET (WIRING DIAGRAM)
(B)	12 V REMOTE	DWG. NO 611C1052

611C1086



DASH NO	CHOKE	MODEL	WIRING HARNESS	CONTROL ASSY
-01	SISSON CHOKE	CCK,NH	338D640	300D1000
-02	ONAN CHOKE	CCK	338D691	300D1000
-03	NO CHOKE GAS CARB	CCK,NH	338D0774	300D1108
-04	NO CHOKE HATKO GAS	CCK,NH	338D0775	300D1108
-05	SISSON CHOKE HATKO	CCK,NH	338D0778	300D1000

RECONNECTION CHART



* GROUNDED AC LEAD

PARTS LIST

REF. DES.	QTY.	DESCRIPTION
	1	CONTROL ASSY
A1	1	CONTROL-GEN SET ASSY
A2	1	CONTROL-START ADAPTER (4 TO 3 WIRE)
S4	1	SWITCH-START STOP (CUSTOMER REMOTE)
W1	1	WIRING HARNESS
F3	1	HOLDER ASSY-FUSE
	1	FUSE
A3	1	CONTROL-DISC ADPTR
	PARTS	LIST ENG GEN (REF)
BT1	1	BATTERY-12 VDC
C1	1	CAPACITOR-0.1 MFD
E1	1	PUMP-FUEL (-01, -02, -05)
E2, E3	2	SPARK PLUG
E5	1	CHOKE-SISSON (-01, -05)
E4	1	CHOKE-ONAN (-02)
G1	1	GENERATOR
G1CR11	1	DIODE-3A
G1R1	1	RESISTOR
K1	1	RELAY-START SOLENOID
F1	1	HOLDER ASSY-FUSE
K2	1	SOLENOID-FUEL (-01, -02, -05)
R1	1	LEAD ASSY-HI TENSION
R2	1	LEAD ASSY-HI TENSION
RT1	1	RESISTOR-HYTENCO 1.72Ω, 25W
S1	1	SWITCH-LOW OIL PRESS
S2	1	SWITCH-HIGH AIR TEMP (-04, -05)
S3	1	BREAKER & CAP ASSY
S4	1	SWITCH-REMOTE START STOP
T1	1	COIL-IGNITION

611C1086

MODEL NO		
5.5NH-**R/12000D 3.5B42CCK-**R/12000R	6.5NH-**R/12000D 4 & 5CCK-**R/12000R	
120/240V., 1PH 4W., 50Hz	120/240V., 1PH 4W., 60Hz	

Onan — DIVISION OF STUDEBAKER CORPORATION

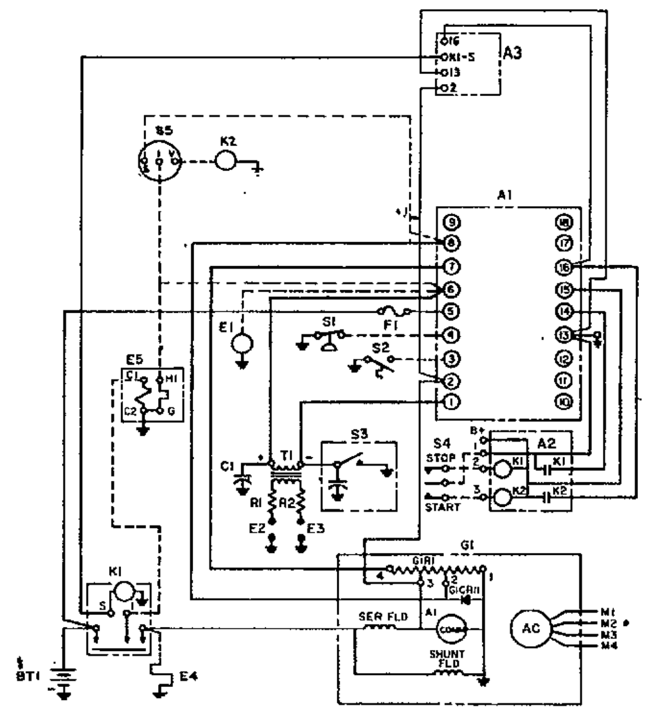
DATE 2-12-75 | DR CDR | CHKD WMH

CONTROL-GEN SET WIRING DIAGRAM

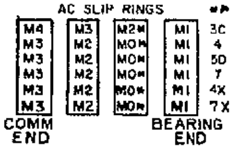
DWG NO 611C1086

611-1090 C

WIRING DIAGRAM

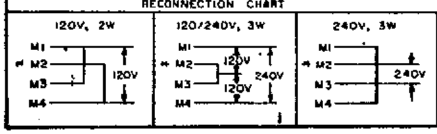


Ⓑ NOTE: 99 VOLTAGE FOR 115 V, 3 PH, 3 WIRE, M0 IS NOT USED



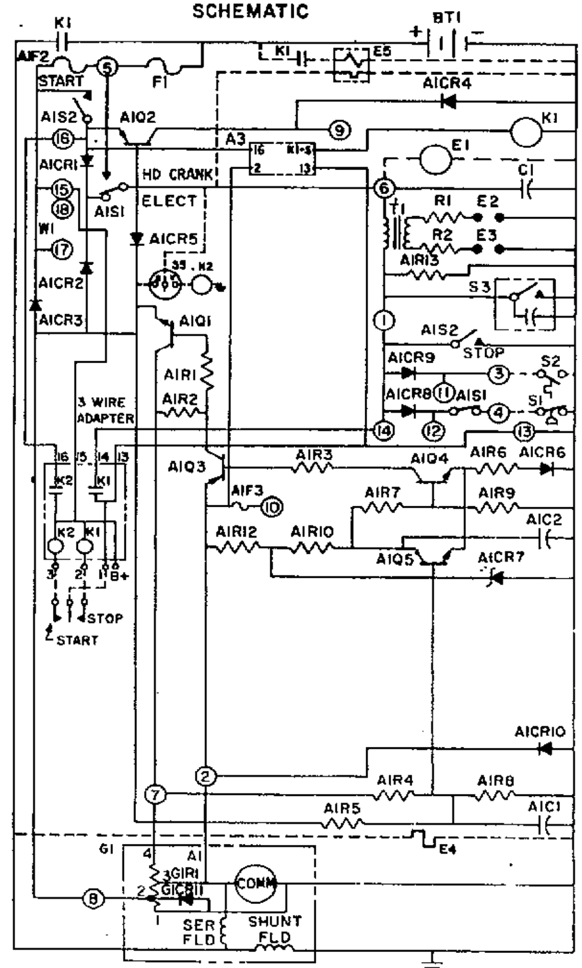
** VOLTAGE CODE	
3C	120/240V, 1PH
4	120/208V, 3PH
5D	120/240V, 3PH
7	220/380V, 3PH
4X	277/480V, 3PH
7X	240/416V, 3PH

RECONNECTION CHART



* GROUNDED AC LEAD Ⓒ

SCHEMATIC



PARTS LIST		
REF. DES.	QTY.	DESCRIPTION
	1	CONTROL ASSY
A1	1	CONTROL-GEN SET ASSY
A2	1	CONTROL-START ADAPTER (4 TO 3 WIRE)
A3	1	CONTROL-DISC ADPTR
W1	1	WIRING HARNESS
	PARTS	LIST ENG GEN (REF)
BT1	1	BATTERY-12 VDC
C1	1	CAPACITOR-0.1 MFD
E1	1	PUMP-FUEL OR GAS VALVE (-07, -08)
E2, E3	2	SPARK PLUG
E4	1	CHOKE - ONAN (-01, -06, -07, -08, -09, -11)
E5	1	CHOKE - THERMO MAG (-03, -12)
G1	1	GENERATOR
G1CR11	1	DIODE-3A
G1R1	1	RESISTOR
K1	1	RELAY-START SOLENOID
K2	1	FUEL-SOLENOID (NAT GAS ONLY)
F1	1	HOLDER ASSY-FUSE
R1	1	LEAD ASSY-HI TENSION
R2	1	LEAD ASSY-HI TENSION
S1	1	SWITCH-LOW OIL PRESS (-03, -04, -06, -08, -10, -11, -12)
S2	1	SWITCH-HIGH AIR TEMP
S3	1	BREAKER & CAP ASSY
S4	1	SWITCH-START STOP (CUSTOMER REMOTE)
S5	1	SWITCH-VACUUM (FUEL SOLENOID) (NAT GAS ONLY)
T1	1	COIL-IGNITION

0601-119

DASH NO	CHOKE	MODEL	WIRING HARNESS	
-01	ONAN CHOKE	CCK	338-0682	D
-02	NO CHOKE, GAS VALVE	CCK	338-0719	D
-03	THERMAL MAG C, LOPKO	NH	338-0718	D
-04	NO CHOKE, GAS, LOPKO, HATKO	CCK	338-0722	D
-05	NO CHOKE GAS VALVE, HATKO	CCK	338-0723	D
-06	ONAN CHOKE, LOPKO	CCK	338-0724	D
-07	ONAN CHOKE, HATKO, F. PUMP	CCK	338-0729	D
-08	F.PUMP, ONAN CHOKE, HATKO, LOPKO	CCK	338-0731	D
-09	ONAN CHOKE, HATKO.	CCK	338-0732	D
-10	LOPKO, NO CHOKE	CCK, NH	338-0736	D
-11	ONAN CHOKE, HATCO, LOPKO	CCK	338-0739	D
-12	THER MAG C, LOPKO, HATKO	NH	338-0743	D

4.0 & 5.0 CCK-■■R/IR
5.5 & 6.5 NH-■■R/IR
120/240V, 1 PH., 4 TO 3W, 60 Hz

Onan — DIVISION OF STUDEBAKER CORPORATION

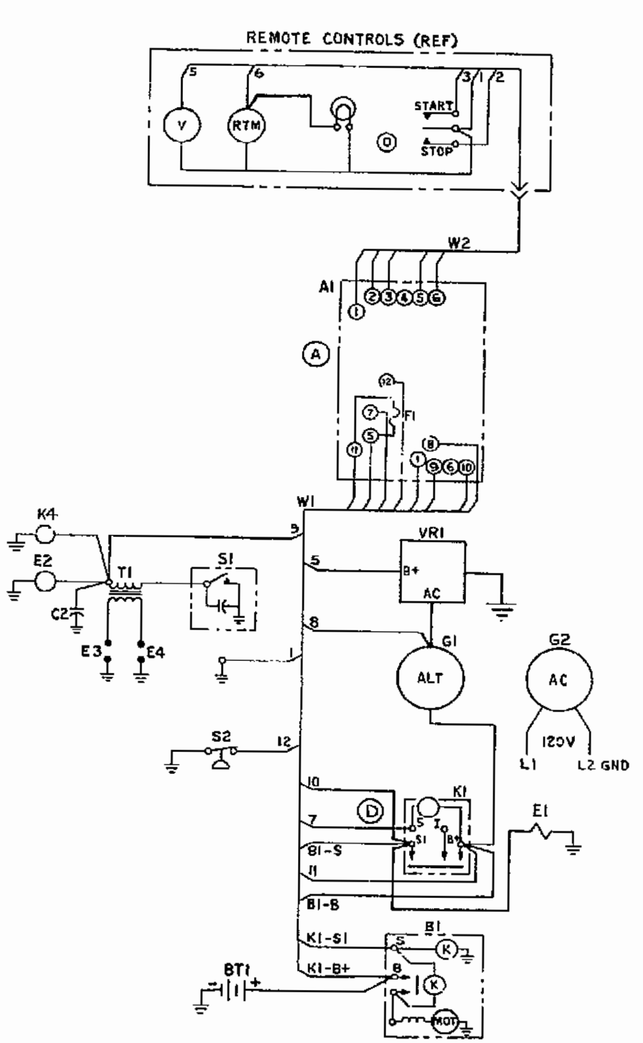
2-12-75 CDR

CONTROL - GEN SET WIRING DIAGRAM

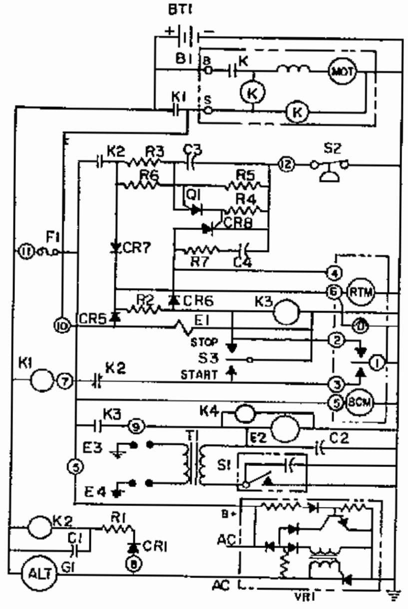
611-1090 C

611C1094

WIRING DIAGRAM



SCHEMATIC



NOTE:
1. MIN START DISCONNECT: 675 RPM.

PARTS LIST

REF. DES.	QTY	DESCRIPTION
	1	CONTROL ASSY-GEN SET
A1	1	CONTROL-HOT HOME
B1	1	STARTER-SOLENOID SHIFT
BT1	1	BATTERY-12 VOLT
C2	1	CAPACITOR
E1	1	CHOKE
E2	1	FUEL PUMP
E3,4	2	SPARK PLUG
G1	1	ALTERNATOR
G2	1	GENERATOR
K1	1	SOLENOID-START
S1	1	BREAKER & CAP ASSY
S2	1	SWITCH-LOW OIL PRESS
K4	1	SOLENOID-FUEL
T1	1	COIL-IGNITION
VR1	1	VOLTAGE REGULATOR
W1	1	WIRING HARNESS-GEN SET
W2	1	WIRING HARNESS-REMOTE

611C1094

MODEL NO.	
-01	4.0BF-1R/9000R 6.0NH-1R/9000R
	120V, 1 PH, 3W, 60 Hz

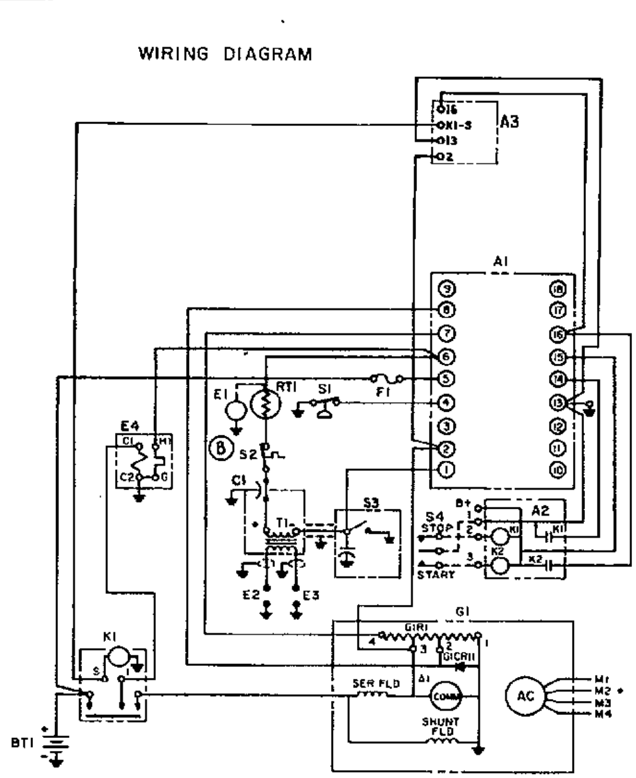
Onan — DIVISION OF STUDEBAKER CORPORATION

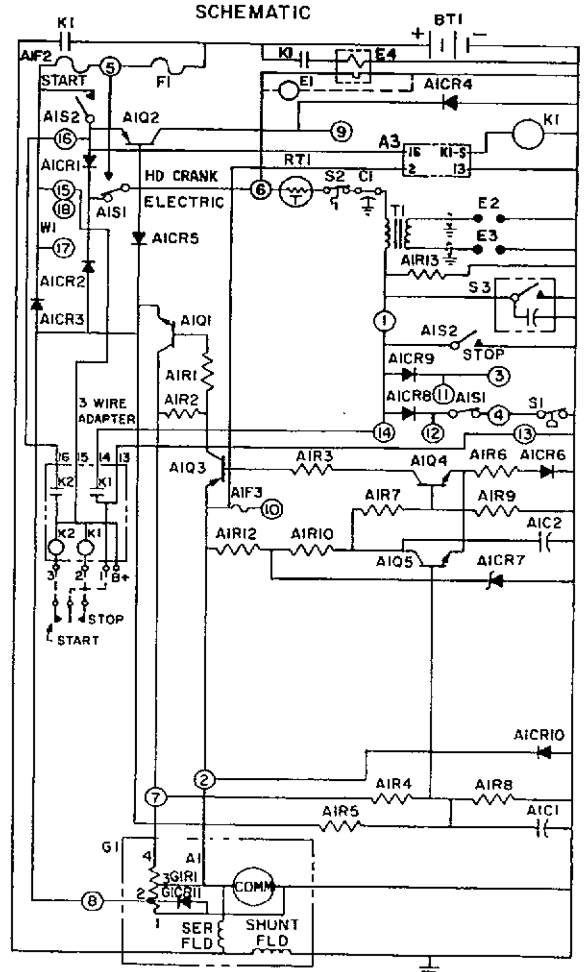
DATE 7-7-72 | DR CDR | CHK HBM | APP WJB

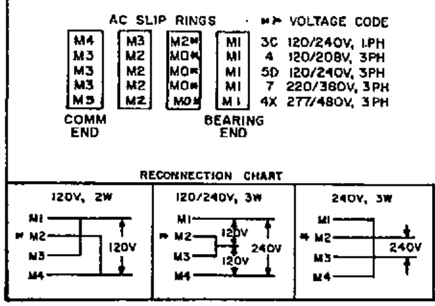
NAME CONTROL - GEN SET (WIRING DIAGRAM)

DWG NO 611C1094

6IICI096







* GROUNDED AC LEAD

DASH NO	CHOKE	MODEL	WIRING HARNESS	CONTROL ASSY
-01	THERMO MAG CHOKE	MCCK	338D712	300C1002
-02	THERMO MAG CHOKE	MCCK	338D712	300C1114

PARTS LIST

REF. DES.	QTY	DESCRIPTION
	1	CONTROL ASSY
A1	1	CONTROL-GEN SET ASSY
A2	1	CONTROL-START ADAPTER (4 TO 3 WIRE)
A3	1	CONTROL-DISC ADPTR
W1	1	WIRING HARNESS
	PARTS	LIST ENG GEN (REF)
BT1	1	BATTERY-12 VDC
C1	1	CAPACITOR-0.1 MFD
E1	1	PUMP-FUEL (WHEN USED)
E2 E3	2	SPARK PLUG
E4	1	CHOKE THERMO MAG
G1	1	GENERATOR
G1CR11	1	DIODE 3A
G1R1	1	RESISTOR
K1	1	RELAY-START SOLENOID
F1	1	FUSE 9A
RT1	1	RESISTOR HYTEMCO 1.72Ω, 75W
S1	1	SWITCH-LOW OIL PRESS
S2	1	SWITCH-HIGH WATER TEMP(WHEN USED)
S3	1	BREAKER & CAP ASSY
S4	1	SWITCH START STOP(CUSTOMER REMOTE)
T1	1	COIL-IGNITION

6IICI096

	ASSY NO
-01	4.0 & 6.5MCCK-3CR/1E
-02	4.0 & 6.5MCCK-3CR/1F
120/240V., 4 TO 3W.	1 PH, 60Hz

Onan DIVISION OF STUDEBAKER CORPORATION

DATE 2-12-75 DR CDR CHECK WMH

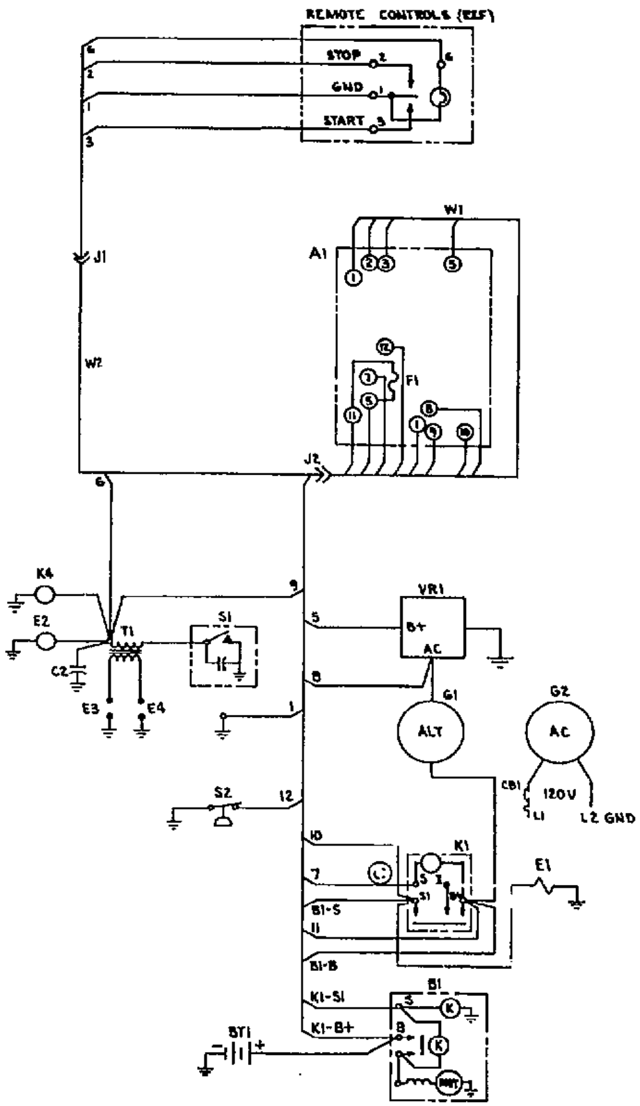
NAME CONTROL - GEN SET WIRING DIAGRAM

DWG NO 6IICI096

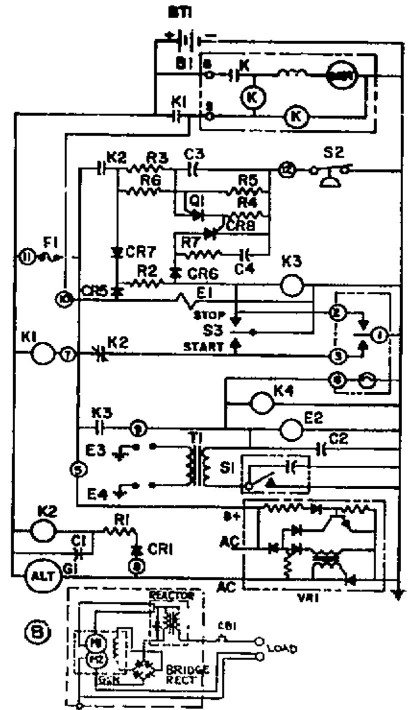
Cummins Power Generation

G11-1109

WIRING DIAGRAM



SCHEMATIC



NOTES:

1. DELUXE REMOTE CONTROL (300-0986(B)) MAY BE USED IF AN ADDITIONAL WIRE, FOR TERMINAL 5 OF J2 TO TERMINAL 5 OF DELUXE REMOTE CONTROL, IS ADDED.
2. ON 4.0 BF-1R/9500A AND 6.0 NH-1R/9500B J1 IS ELIMINATED AND THE ADDITIONAL WIRE FOR THE DELUXE REMOTE CONTROLS IS PROVIDED.
3. MIN START DISCONNECT = 675 RPM

PARTS LIST

REF. DES.	QTY	DESCRIPTION
	1	CONTROL ASSY-GEN SET
A1	1	CONTROL-BOT HOME
B1	1	STARTER-SOLENOID SHIFT
BT1	1	BATTERY-12 VOLT
C2	1	CAPACITOR
E1	1	CHOKE
E2	1	FUEL PUMP
E3,4	2	SPARK PLUG
G1	1	ALTERNATOR
G2	1	GENERATOR
K1	1	SOLENOID-START
K4	1	SOLENOID-FUEL
S1	1	BREAKER & CAP ASSY
S2	1	SWITCH-LOW OIL PRESS
T1	1	COIL-IGNITION
VR1	1	VOLTAGE REGULATOR
W1	1	WIRING HARNESS-GEN SET
W2	1	WIRING HARNESS-REMOTE
J1	1	CONNECTOR 4 CKT
J2	1	CONNECTOR 12 CKT
CB1	1	CIRCUIT BREAKER (40A 4BF) (50A 6NH)

60.1-119

MODEL NO.	
-01	4.0 BF-1R/9000 B 6.0 NH-1R/9000 E
	12.0V, 1PH., 3W., 60 Hz

Onan DIVISION OF STUDEBAKER CORPORATION Minneapolis, Minnesota

DATE 9-14-73 | EE

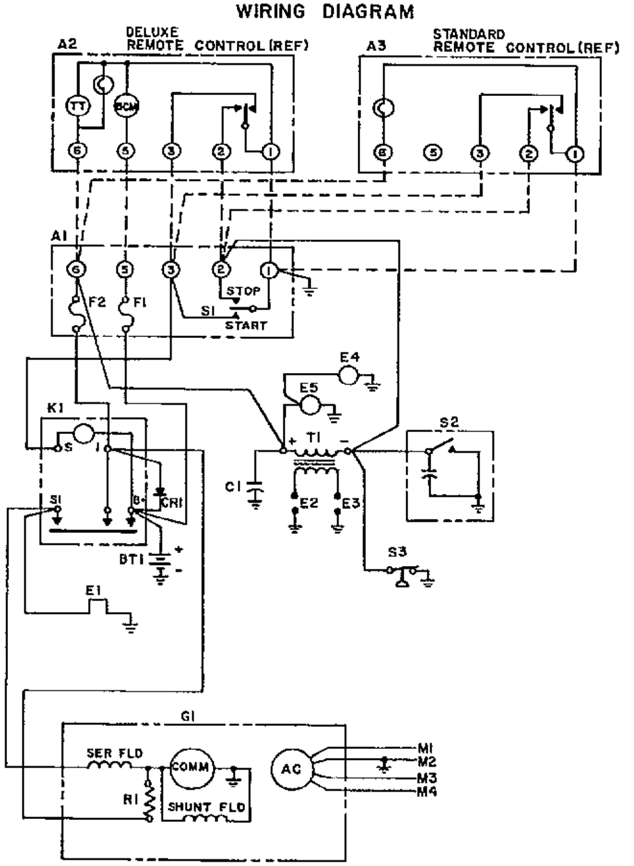
NAME CONTROL-GEN SET (WIRING DIAGRAM)

DWG. NO. G11-1109

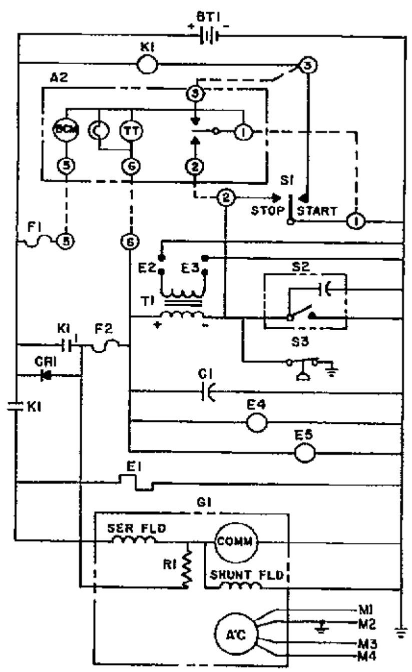
C

611-1123 C

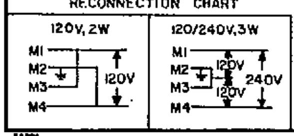
WIRING DIAGRAM



SCHEMATIC



RECONNECTION CHART



PARTS LIST

REF. DES.	QTY	DESCRIPTION
A1	1	CONTROL ASSY
A2	1	DELUXE REMOTE CONTROL (REF)
A3	1	STANDARD REMOTE CONT (REF)
BT1	1	BATTERY 12V
C1	1	CAPACITOR
CR1	1	DIODE ASSY (REF)
E1	1	CHOKE-ONAN
E2,3	2	SPARK PLUG
E4	1	SOLENOID-FUEL (REF)
E5	1	FUEL-PUMP (REF)
F1,2	2	FUSE (9AMP, 32V) (REF)
G1	1	GENERATOR
K1	1	SOLENOID-START
R1	1	RESISTOR FIXED (REF)
S1	1	SWITCH-START-STOP
S2	1	BREAKER & CAP ASSY
S3	1	SWITCH-LOW OIL PRESS (REF)
T1	1	COIL-IGNITION
OPTION	1	WIRING HARNESS (CONN-REMOTE (REF)
OPTION W1	1	WIRING HARNESS (CABLE-REMOTE CONTROL) (10 FEET LONG) (REF)
OPTION W2	1	WIRING HARNESS (CABLE-REMOTE CONTROL) (30 FEET LONG) (REF)

611-1123 C

MODEL NO.	
-01	4.0BF-3CR/16002A
	120/240V. 1PH. 4W. 60Hz

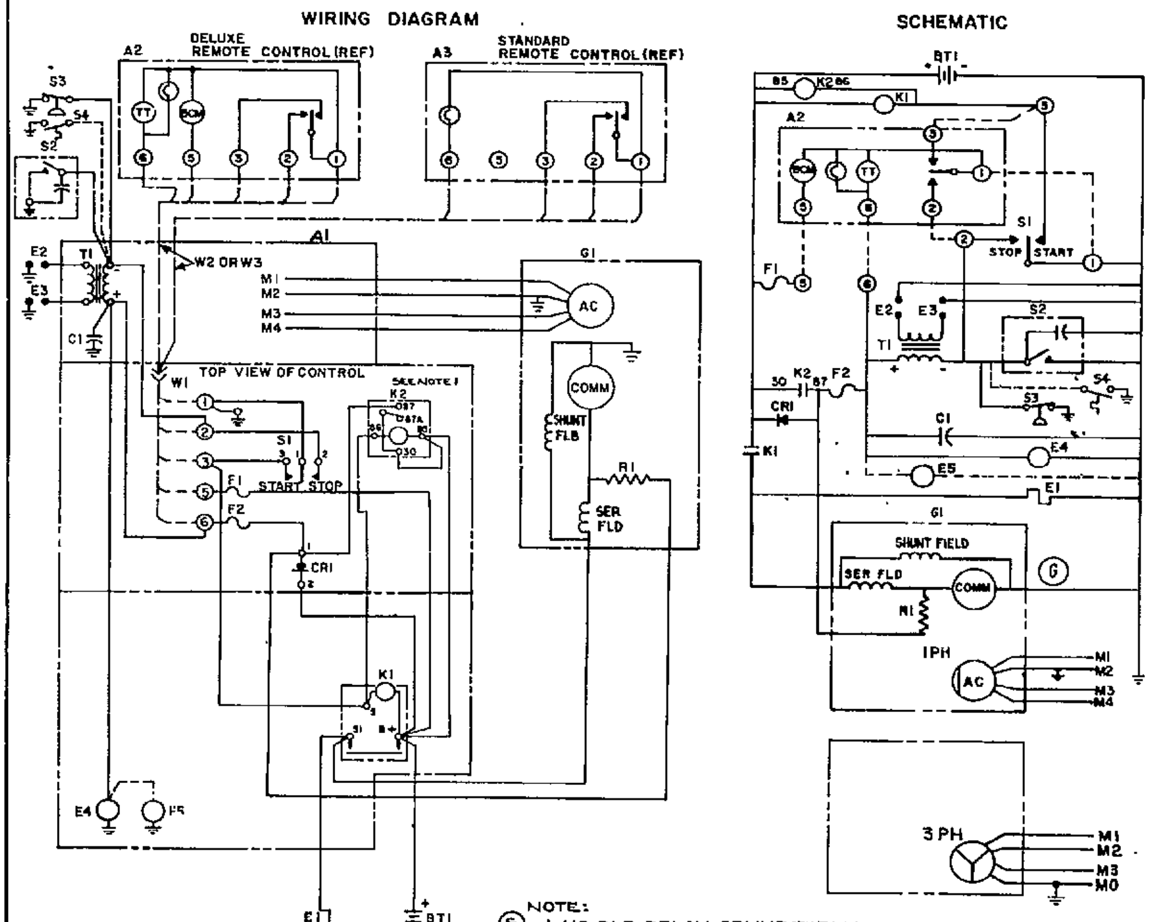
Onan DIVISION OF STUDEBAKER CORPORATION

DATE 4-10-75 | DR. CIP | ENGR. | CK. WJB

NAME CONTROL-GEN SET (WIRING DIAGRAM)

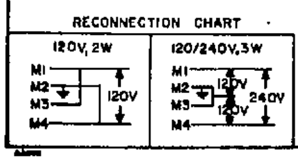
DWG. NO. 611-1123 | DWG SIZE C

611-1127 C



NOTE:
(S) 1. K2 OLD RELAY CONNECTIONS ARE 1,2,3 & 4.
#1 WOULD BE THE SAME AS #85
#2 WOULD BE THE SAME AS #30
#3 WOULD BE THE SAME AS #86
#4 WOULD BE THE SAME AS #87

RECONNECTION CHART



PARTS LIST

REF. DES.	QTY	DESCRIPTION
A1	1	CONTROL ASSY -01,-06
	1	CONTROL ASSY -02
	1	CONTROL ASSY -05
	1	CONTROL ASSY -04
ALL PART NO'S BELOW ARE REF. ONLY		
A2	1	DELUXE REMOTE CONTROL
A3	1	STANDARD REMOTE CONTROL
BT1	1	BATTERY 12V
C1	1	CAPACITOR
CR1	1	RECTIFIER
E1	1	CHOKE-ONAN
E2,E3	2	SPARK PLUG
E4	1	FUEL PUMP
E5	1	SOLENOID - FUEL (WHEN USED)
F1,2	2	FUSE (5AMP,32V)
G1	1	GENERATOR
K1	1	SOLENOID-START
K2	1	RELAY-IGNITION
R1	1	RESISTOR-FIXED (BF)
	1	RESISTOR-FIXED (NH & CCK)
S1	1	SWITCH-START-STOP
S2	1	BREAKER & CAP ASSY
S3	1	SWITCH-LOW OIL PRESS
* S4	1	SWITCH-HIGH AIR TEMP
T1	1	COIL-IGNITION
OPTION W1	1	WIRING HARNESS (CONN-REMOTE)
OPTION W2	1	WIRING HARNESS (CABLE-REMOTE CONTROL) (10 FEET LONG)
OPTION W3	1	WIRING HARNESS (CABLE-REMOTE CONTROL) (30 FEET LONG)

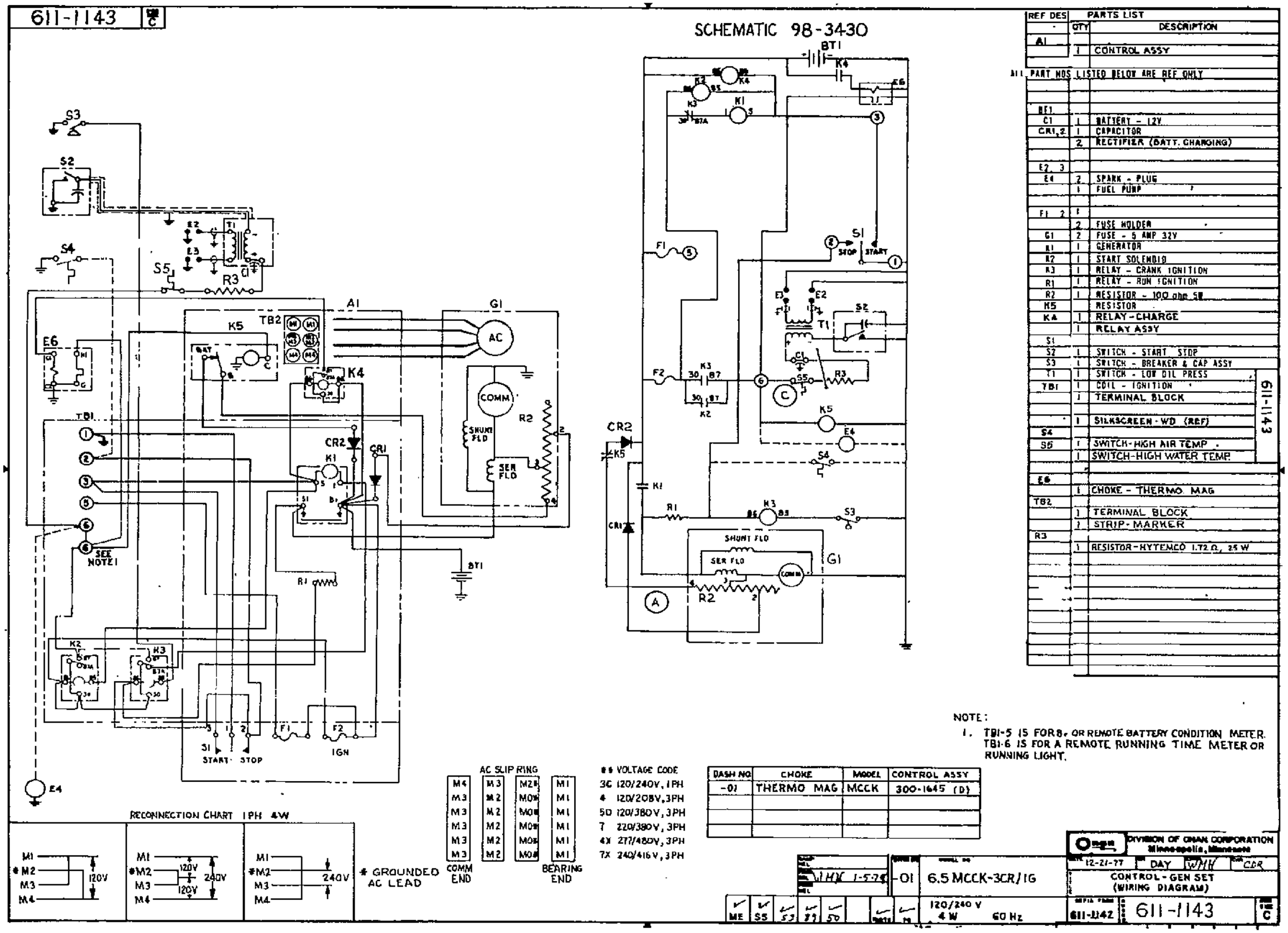
611-1127 C

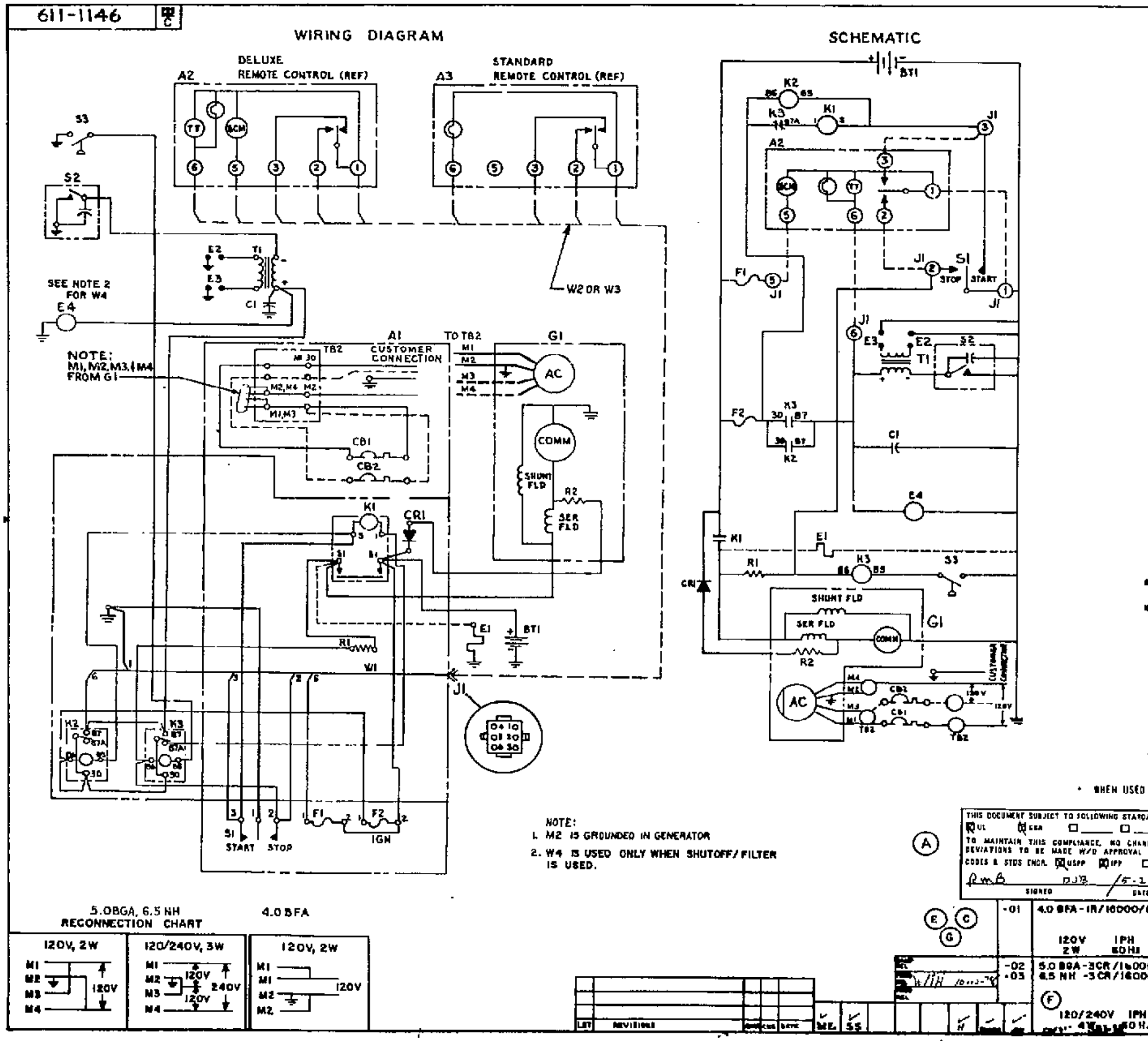
S	ADDED NOTE 1			
R	K2 WAS 307-1487			
N	-05 ADDED TO -01			
P	A1 WAS 300-1324,-05			

* WHEN USED

-05	5-6.5 CCK-NH 3CR/16000
-04	4.0 BF-5R/16000B 127/220V,3PH,4W,60Hz
-03	5.0CCK-4R/18089U 120/208V,3PH,4W,60Hz
-02	4.2 CCK-57R/16001U 220/380V., 3PH., 4W., 50Hz.
-01	4.0 BF-3CR/16000 5.0 CCK-3CR/16004 6.5NH-3CR/16004J 120/240V. 1PH. 4W. 60Hz

Onan DIVISION OF ONAN CORPORATION
10-8-75 RKE
CONTROL-GEN SET (WIRING DIAGRAM)
SEPIA FROM 611-1130
611-1127 C


611-1143
SCHEMATIC 98-3430
PARTS LIST
REF DES | QTY | DESCRIPTION
A1 | 1 | CONTROL ASSY
ALL PART NOS LISTED BELOW ARE REF ONLY
BT1 | 1 | BATTERY - 12V
C1 | 1 | CAPACITOR
CR1,2 | 2 | RECTIFIER (BATT. CHARGING)
E2, 3 | 2 | SPARK - PLUG
E4 | 1 | FUEL PUMP
F1 2 | 2 | FUSE HOLDER
| 2 | FUSE - 5 AMP 32V
G1 | 1 | GENERATOR
K1 | 1 | START SOLENOID
K2 | 1 | RELAY - CRANK IGNITION
K3 | 1 | RELAY - RUN IGNITION
R1 | 1 | RESISTOR - 100 ohm 5W
R2 | 1 | RESISTOR
K5 | 1 | RELAY-CHARGE
K4 | 1 | RELAY ASSY
S1 | 1 | SWITCH - START STOP
S2 | 1 | SWITCH - BREAKER & CAP ASSY
S3 | 1 | SWITCH - LOW OIL PRESS
T1 | 1 | COIL - IGNITION
TB1 | 1 | TERMINAL BLOCK
| 1 | SILKSCREEN - WD (REF)
S4 | 1 | SWITCH-HIGH AIR TEMP
S6 | 1 | SWITCH-HIGH WATER TEMP
E6 | 1 | CHOKE - THERMO MAG
TB2 | 1 | TERMINAL BLOCK
| 1 | STRIP-MARKER
R3 | 1 | RESISTOR-HYTEMCO 1.72 Ω, 25 W
NOTE:
1. TB1-5 IS FOR B+ OR REMOTE BATTERY CONDITION METER. TB1-6 IS FOR A REMOTE RUNNING TIME METER OR RUNNING LIGHT.
DASH NO | CHOKE | MODEL | CONTROL ASSY
-01 | THERMO MAG | MCCK | 300-1645 (D)
VOLTAGE CODE
3C 120/240V, 1PH
4 120/208V, 3PH
5D 120/380V, 3PH
7 220/380V, 3PH
4X 277/480V, 3PH
7X 240/416V, 3PH
AC SLIP RING
COMM END
BEARING END
GROUNDED AC LEAD
RECONNECTION CHART 1PH 4W
120V
240V
ONAN DIVISION OF ONAN CORPORATION Minneapolis, Minnesota
12-21-77
CONTROL - GEN SET (WIRING DIAGRAM)
-01 6.5 MCCK-3CR/1G
120/240 V 4 W 60 Hz
611-1142
611-1143
C
S3 S2 S4 S5 E6 TB1 E4 R3 T1 E2 E3 C1 K5 TB2 A1 G1 AC COMM SHUNT FLD SER FLD R2 K4 CR2 CR1 K1 R1 BT1 K2 K3 F1 F2 IGN S1 START STOP SEE NOTE 1



PARTS LIST

REF DES	QTY	DESCRIPTION
A1	1	CONTROL ASSY (-01) 30 AMP
	1	CONTROL ASSY (-02) (1) 20 & (1) 30 AMP
	1	CONTROL ASSY (-03) (2) 30 AMP
A2	1	DELUXE REMOTE CONTROL
A3	1	STANDARD REMOTE CONTROL
BT1	1	BATTERY - 12V
C1	1	CAPACITOR
CR1	1	RECTIFIER (BATT. CHARGING)
E1	1	CHOKE - ONAN (NOT USED WITH LPG)
E2, 3	2	SPARK - PLUG
E4	1	FUEL PUMP OR SHUTOFF/FILTER-LPG
F1, 2	2	FUSE HOLDER
	2	FUSE - 5 AMP 32V
G1	1	GENERATOR
K1	1	START SOLENOID
K2	1	RELAY - CRANK IGNITION
K3	1	RELAY - RUN IGNITION
R1	1	RESISTOR - 150 ohm 5W
R2		RESISTOR
J1	1	SOCKET PLUG-REMOTE
S1	1	SWITCH - START, STOP
S2	1	SWITCH - BREAKER & CAP ASSY
S3	1	SWITCH - LOW OIL PRESS
T1	1	COIL - IGNITION
TB2	1	TERMINAL BOARD
	1	SILKSCREEN - SCHEMATIC
CB1, CB2	1	CIRCUIT BREAKER 30 AMP (-01, -02, -03)
CB2	1	CIRCUIT BREAKER 20 AMP (-02)
W1	1	WIRING HARNESS (CONN-REMOTE)
• W2	1	WIRING HARNESS (CABLE-REMOTE CONTROL) (10 FEET LONG)
• W3	1	WIRING HARNESS (CABLE-REMOTE CONTROL) (30 FEET LONG)
W4	1	LEAD ASSY (SHUTOFF/FLTR ONLY)

611-1146

• WHEN USED

THIS DOCUMENT SUBJECT TO FOLLOWING STANDARDS/CODES: UL, CSA. TO MAINTAIN THIS COMPLIANCE, NO CHANGES OR DEVIATIONS TO BE MADE W/O APPROVAL OF CODES & STDS ENGR. USPP, IPP, RDLD. SIGNED DJB DATE 5-17-79

-01	4.0 BFA-1R/16000/B 120V 2W 1PH 60HZ
-02, -03	5.0 BGA-3CR/16000/B, 6.5 NH-3CR/16000/M 120/240V 1PH 60HZ

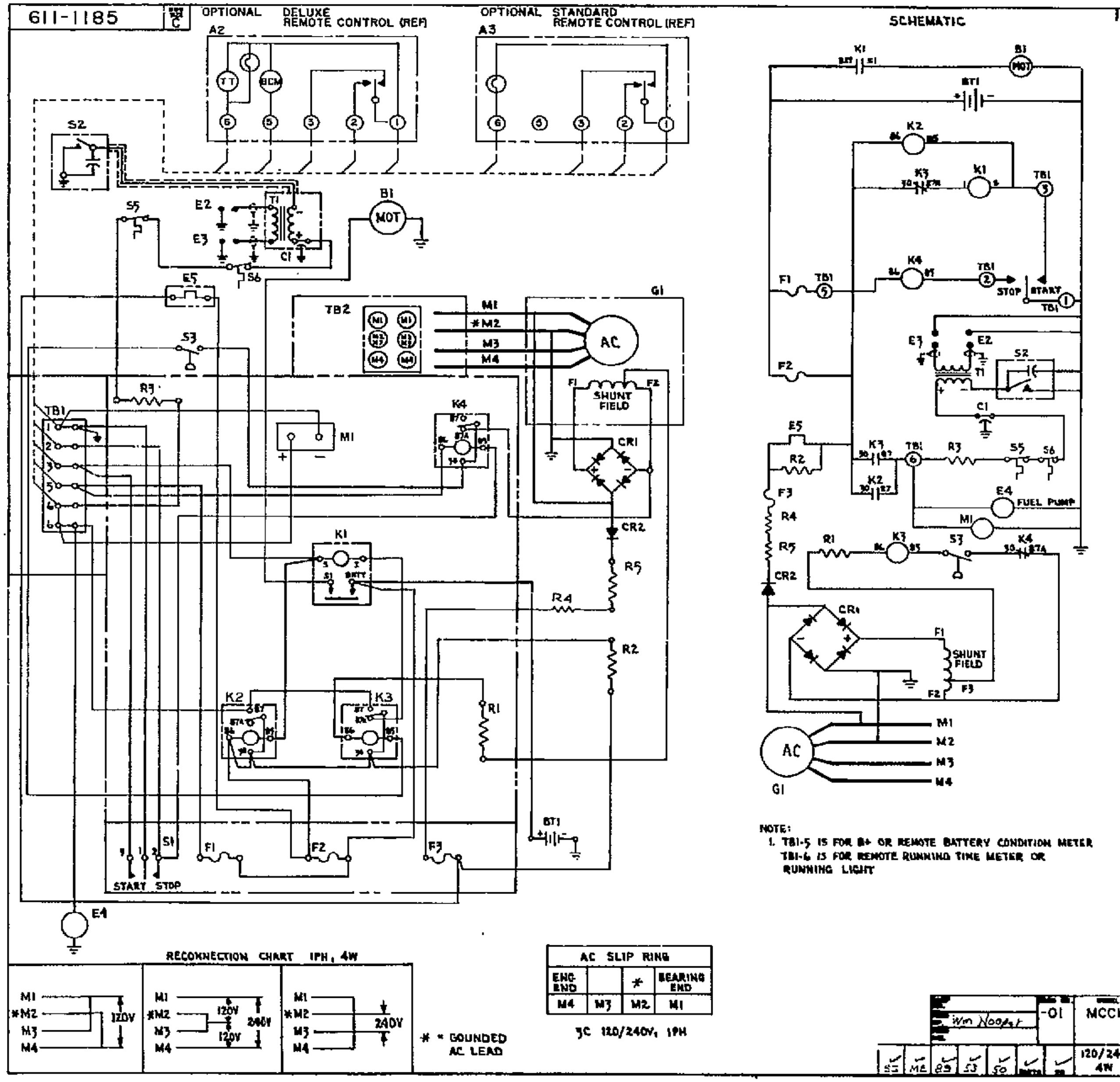
ONAN DIVISION OF ONAN CORPORATION Minneapolis, Minnesota

9-22-78

CONTROL-GEN SET (WIRING DIAGRAM)

611-1135

611-1146 C



PARTS LIST

REF DES	QTY	DESCRIPTION
	1	CONTROL ASSY
PARTS LIST CONTROL		(REF)
BT1	1	BATTERY-12V
B1	1	MOTOR-STARTER
C1	1	CONDENSER ASSY (1.75 µf, 100 VDC)
CR1	1	RECTIFIER-BRIDGE
CR2		RECTIFIER-SILICON (6-12A, 280V)
E2,3	2	PLUG-SPARK
E4	1	PUMP-FUEL
E5	1	CHOKE-ELECT (ONAN)
F1,2,3	3	FUSE-5 AMP, 32V
	3	HOLDER-FUSE
G1		GENERATOR
K1	1	RELAY-START SOLENOID
K2	1	RELAY-CRANK IGNITION
K3	1	RELAY-RUN IGNITION
K4	1	RELAY STOP
M1	1	METER-RUNNING TIME
R1	1	RESISTOR-100Ω, 5W
R2	1	RESISTOR-10 Ω, 50W
R3	1	RESISTOR-HYTEMCO 1.72Ω, 25W
R4,R5	2	RESISTOR-4 Ω, 25W
S1	1	SWITCH-START STOP
S2	1	SWITCH-BREAKER & CAP ASSY
S3	1	SWITCH-LOW OIL PRESSURE
S5	1	SWITCH-HIGH WATER TEMP
S6	1	SWITCH-HIGH EXH TEMP
T1	1	COIL-IGNITION
TB1	1	TERMINAL BLOCK
	1	MARKER STRIP
TB2	1	TERMINAL BLOCK
	1	MARKER STRIP
A2	1	CONTROL-DELUXE REMOTE
A3	1	CONTROL-REMOTE (STANDARD)

611-1185

Onan — DIVISION OF ONAN CORPORATION, Minneapolis, Minnesota

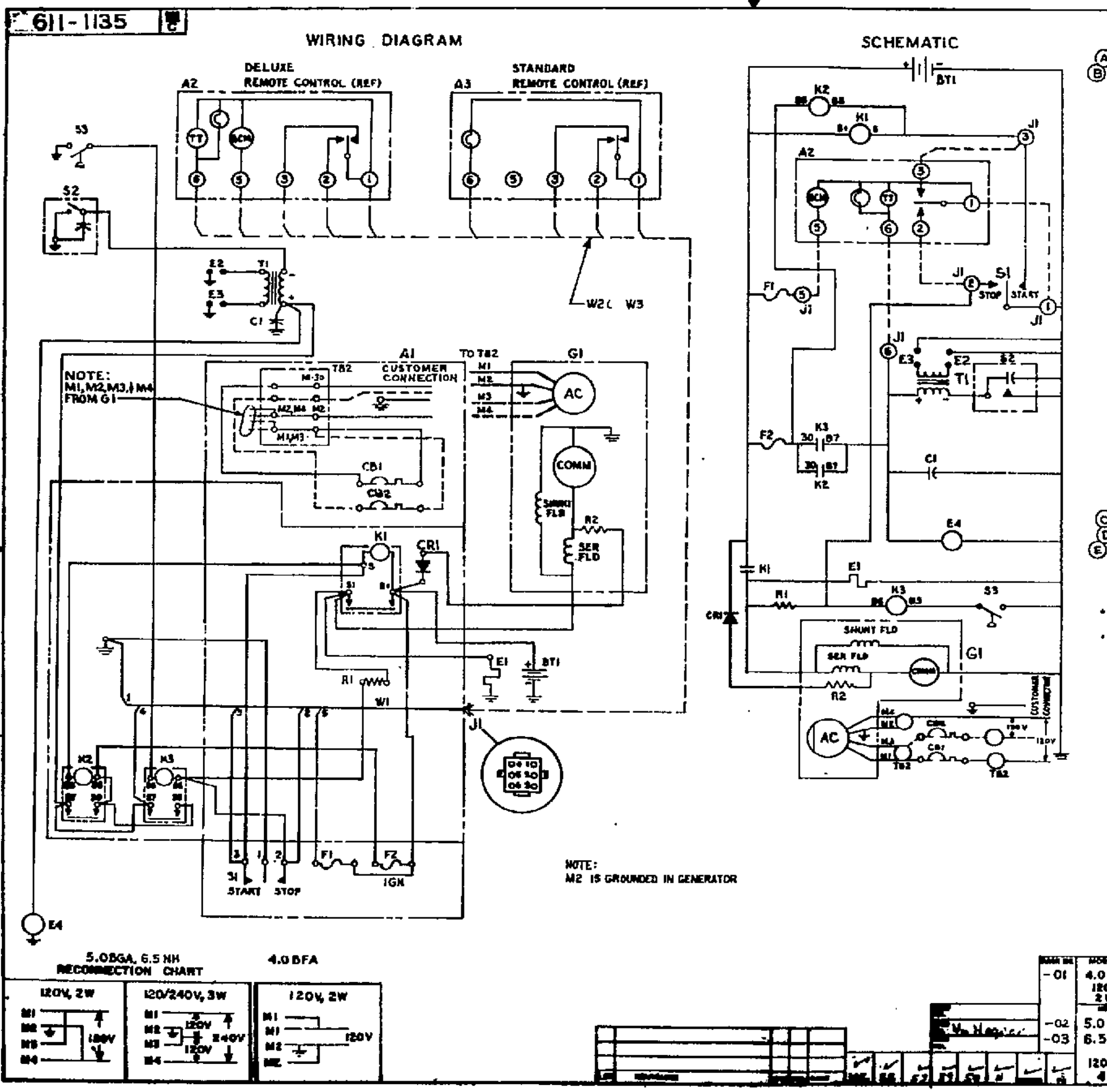
3-9-88 RLW

CONTROL - GEN SET (WIRING DIAGRAM)

-01 MCCK/J

120/240V 4W 1PH 60Hz

611-1145 611-1185 C

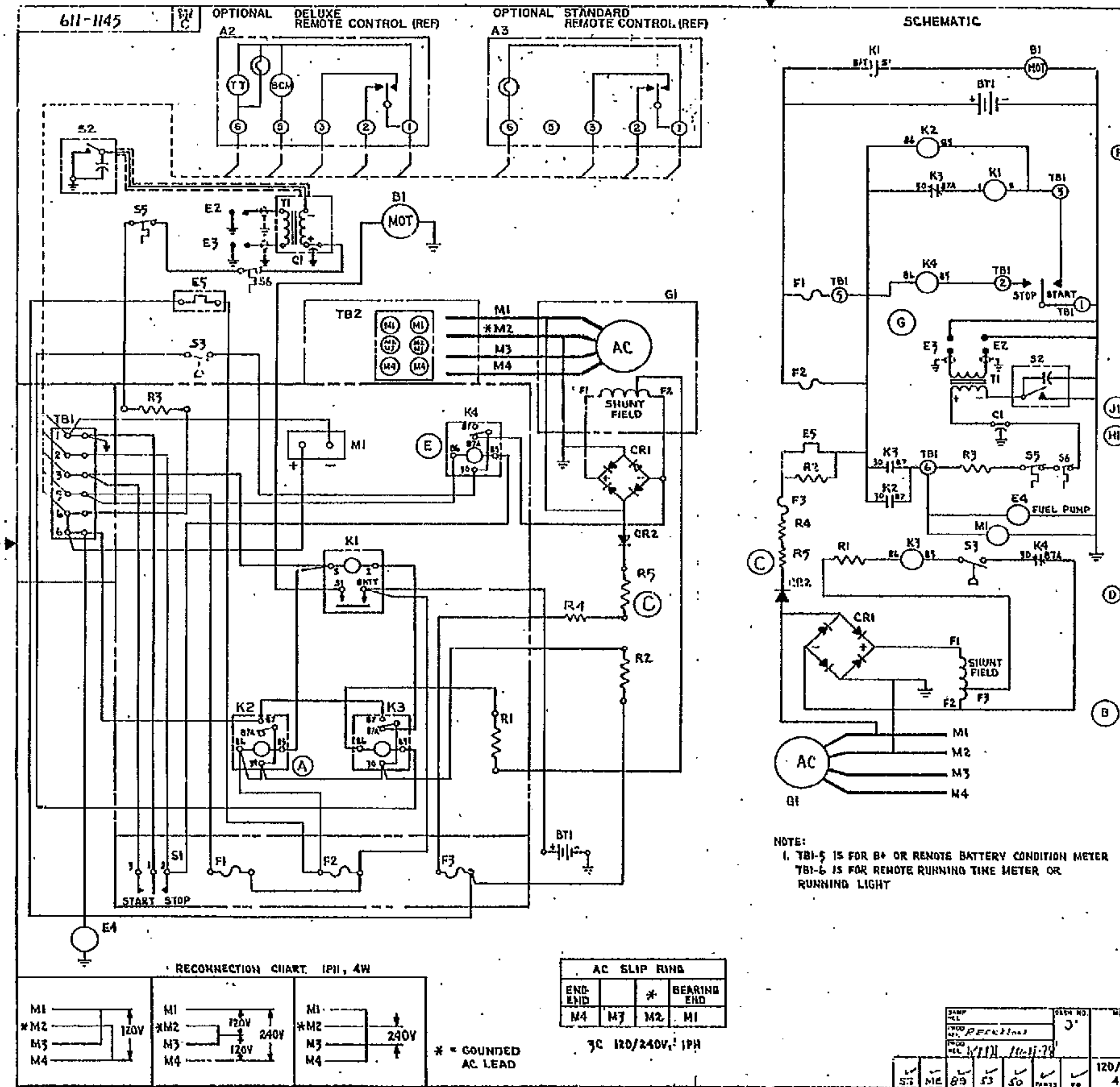


REF DES	PART NO		QTY	DESCRIPTION
				PARTS LIST
A1	300-1601	D	1	CONTROL ASSY (-01) 30 AMP
	300-1602	D	1	CONTROL ASSY (-02) (1) 20 & (1) 30 AMP
	300-1603	D	1	CONTROL ASSY (-03) (2) 30 AMP
				ALL PART NOS LISTED BELOW ARE REF ONLY
A2	300-0986	B	1	DELUXE REMOTE CONTROL
A3	300-0985	B	1	STANDARD REMOTE CONTROL
BT1			1	BATTERY - 12V
C1	312-0050	A	1	CAPACITOR
CR1	357-0030	P	1	RECTIFIER (BATT. CHARGING)
E1			1	CHOKE - ONAN
E2 3			2	SPARK - PLUG
E4	149-1542		1	FUEL PUMP
F1 2	321-0175	P	2	FUSE HOLDER
	321-0174		2	FUSE - 5 AMP 32V
G1			1	GENERATOR
K1	307-1420	B	1	START SOLENOID
K2	307-1575	P	1	RELAY - CRANK IGNITION
K3	307-1575	P	1	RELAY - RUN IGNITION
R1	304-0431	P	1	RESISTOR - 150 ohm 5W
R2				RESISTOR
J1	323-0440	C	1	SOCKET PLUG-REMOTE
S1	308-0303	A	1	SWITCH - START, STOP
S2			1	SWITCH - BREAKER & CAP ASSY
S3			1	SWITCH - LOW OIL PRESS
T1	166-0543	C	1	COIL - IGNITION
TB2	332-0254	A	1	TERMINAL BOARD
	98-3331	B	1	SILKSCREEN - WD (REF)
CB1, CB2	320-0544	C	1	CIRCUIT BREAKER 30 AMP (-01)(-03)
CB2	320-0692	C	1	CIRCUIT BREAKER 20 AMP (-02)
W1	338-1078	C	1	WIRING HARNESS (COMM-REMOTE)
* W2	338-1080	C	1	WIRING HARNESS (CABLE-REMOTE CONTROL) (10 FEET LONG)
* W3	338-1081	C	1	WIRING HARNESS (CABLE-REMOTE CONTROL) (30 FEET LONG)

-01 4.0 BFA-1R/16000A 120V 2W 1PH 60 Hz
-02 5.0 BGA-3CR/16000A
-03 6.5 NH -3CR/16000A
120/240V 4W 1PH

E REM 320-0544 (C)
D WAS 320-0547 (C)
C ADD CB2 (-03)
B 300-1603 ADD (2) 30 AMP
A 300-1602 ADD (1) 20 & (1) 30 AMP

ONAN DIVISION OF ONAN CORPORATION Minneapolis, Minnesota
CONTROL-GEN SET (WIRING DIAGRAM)
611-1135



PARTS LIST

REF DES.	PART NO.		QTY	DESCRIPTION
	300-1761	D	1	CONTROL ASSY
	PARTS LIST CONTROL			(REF)
BT1			1	BATTERY-12V
B1			1	MOTOR-STARTER
C1	312-0083	P	1	CONDENSER ASSY (1.25μf 100 VDC)
CR1	305-0653	P	1	RECTIFIER-BRIDGE
CR2	357-0030	P		RECTIFIER-SILICON (6-12A, 280V)
E2,3			2	PLUG-SPARK
E4			1	PUMP-FUEL
E5			1	CHOKE-ELECT (ONAN)
F1,2	321-0174	-	2	FUSE-5 AMP, 32V
	321-0175	P	3	HOLDER-FUSE
F3	321-0153		1	FUSE-3 AMP
G1				GENERATOR
K1	307-1017	B	1	RELAY-START SOLENOID
K2	307-1886	P	1	RELAY-CRANK IGNITION
K3	307-2879	B	1	RELAY-RUN IGNITION
K4	307-1886	P	1	RELAY STOP
M1	3020885	A	1	METER-RUNNING TIME
R1	352-0161	P	1	RESISTOR-100Ω, 5W
R2		-	1	RESISTOR-25Ω, 50W
R3	304-0060	A	1	RESISTOR-HYTENCO 1.72Ω, 25W
R4,R5			2	RESISTOR-25Ω, 25W
S1	308-0383	A	1	SWITCH-START STOP
S2			1	SWITCH-BREAKER & CAP ASSY
S3			1	SWITCH-LOW OIL PRESSURE
S5			1	SWITCH-HIGH WATER TEMP
S6			1	SWITCH-HIGH EXH TEMP
T1			1	COIL-IGNITION
TB1	332-0699	A	1	TERMINAL BLOCK
	332-2103	A	1	MARKER STRIP
TB2	332-0236	A	1	TERMINAL BLOCK
	332-2117	A	1	MARKER STRIP
A2	300-0986	B	1	CONTROL-DELUXE REMOTE
A3	300-0985	B	1	CONTROL-REMOTE (STANDARD)

611-1145

		REVISION			DATE
39898	J1	K2,3,4 WAS 307-1575		JC	1-15-96
29650	H1	ADD M1, TIME METER		JC	3-30-87
6904	G	WAS TB1-6 TO K4-86			9-29-86
6875	F	CR1 WAS 305-0517		RW	5-23-81
6647	E	WAS K4-86 TO E5			5-28-81
2508	D	ADDED S6		RW	9-29-80
	C	ADD R5, CHG. QTY. ≤2			6-21-79
	B	ADDED RMT CONTS A2			6-12-79
	A	CORRECTED K2 WIRING			1-29-79

Onan DIVISION OF ONAN CORPORATION Minneapolis, Minnesota

CONTROL - GEN SET (WIRING DIAGRAM)

DATE 8-30-78 DFO

MODEL NO. MCCK/H

120/240V 4W 1PH 60Hz.

611-1145 SIZE C

Onan Corporation
1400 73rd Avenue N.E.
Minneapolis, MN 55432
Telex: 275477
Fax 612-574-8087

Power Generation